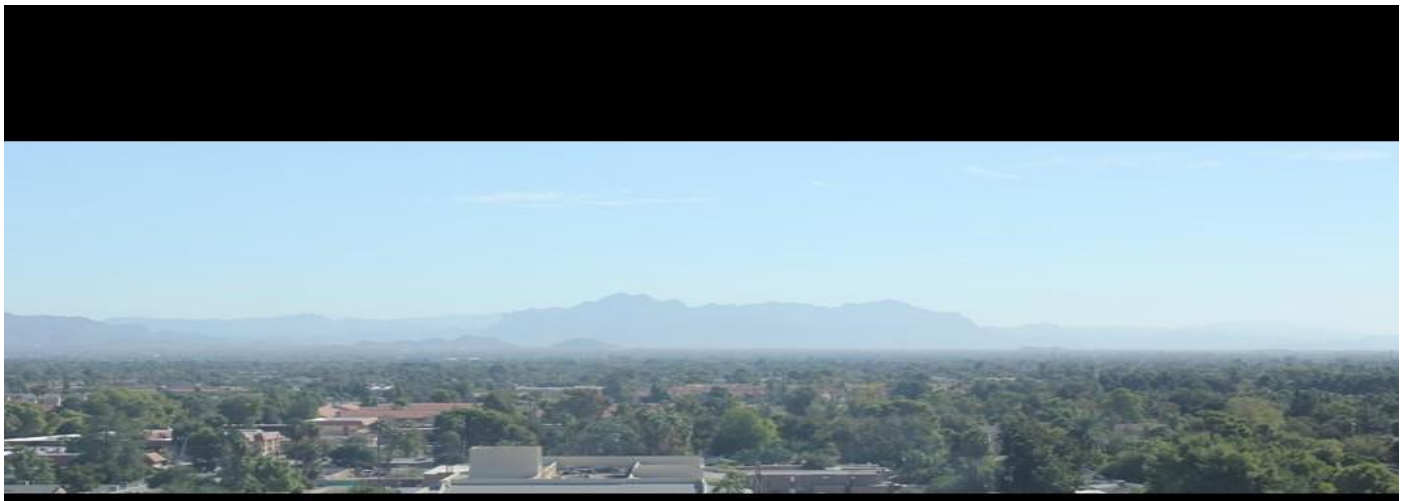
State of Arizona Exceptional Event Documentation for October 9, 2013, for the Phoenix PM10 Nonattainment Area

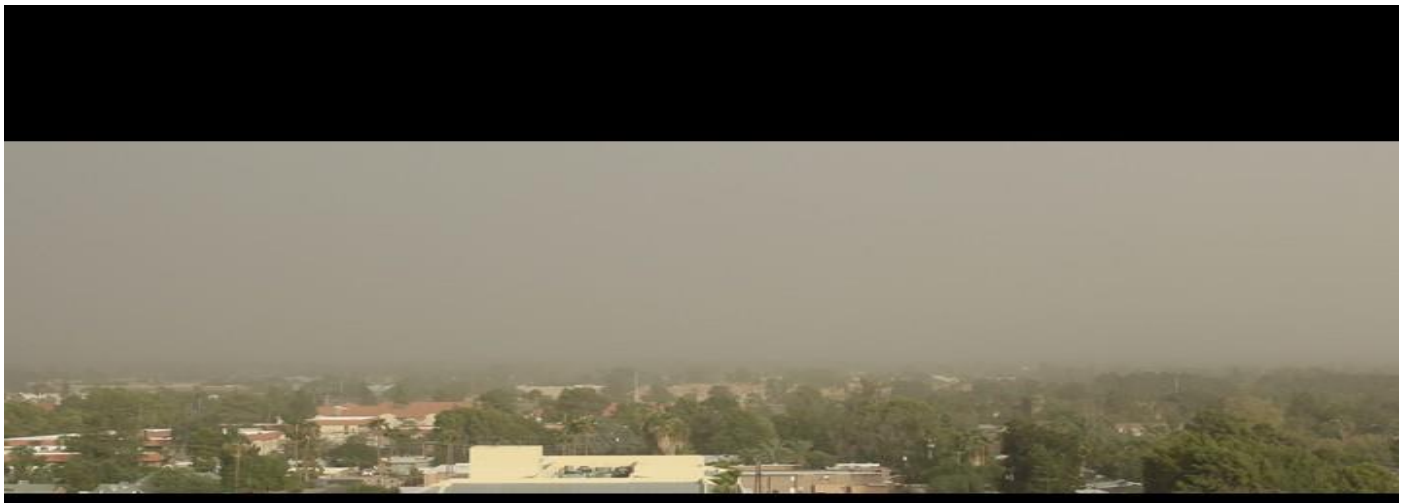
Produced by:

Arizona Department of Environmental Quality
Maricopa County Air Quality Department
Maricopa Association of Governments

FINAL Report
December, 2013



View of Superstition Mountains before High Wind Dust Event: October 9, 2013, 9:30 AM



View of Superstition Mountains during High Wind Dust Event: October 9, 2013, 5:00 PM

Table of Contents

List of Figures

List of Tables

List of Appendices

I. EXCEPTIONAL EVENT RULE (EER) REQUIREMENTS

In addition to the technical requirements that are contained within the EER, procedural requirements must also be met in order for EPA to concur with the flagged air quality monitoring data. This section of the report lays out the requirements of the EER and associated guidance, and discusses how the Arizona Department of Environmental Quality (ADEQ) addressed those requirements.

Procedural Requirements

This section presents a review of the procedural requirements of the EER as required by 40 CFR 50.14 (Treatment of Air Quality Monitoring Data Influenced by Exceptional Events) and explains how ADEQ fulfills them. The Federal EER requirements include public notification that an event was occurring, the placement of informational flags on data in EPA's Air Quality System (AQS), the notification of EPA of the intent to flag through submission of initial event description, the documentation that the public comment process was followed, and the submittal of a demonstration supporting the exceptional events flag. ADEQ has addressed all of these procedural and documentation requirements.

Public notification that event was occurring (40 CFR 50.14(c)(1(i))

ADEQ issued Dust Control Action Forecasts and Ensemble Forecasts for the Greater Phoenix area advising citizens of the potential for high wind / dust events on October 9, 2013. More information on ADEQ's forecasting program can be found in Section IV. The forecast products that were issued for October 9, 2013, are included in Appendix A.

Place informational flag on data in AQS (40 CFR 50.14(c)(2)(ii))

ADEQ and other operating agencies in Arizona submit data into EPA's AQS. Data from both filter-based and continuous monitors operated in Arizona are submitted to AQS.

When ADEQ and/or another agency operating monitors in Arizona suspects that data may be influenced by an exceptional event, ADEQ and/or the other operating agency expedites analysis of the filters collected from the potentially-affected filter-based air monitoring instruments, quality assures the results and submits the data into AQS. ADEQ and/or other operating agencies also submit data from continuous monitors into AQS after quality assurance is complete.

If ADEQ and/or the operating agency have determined a potential exists that the monitor reading has been influenced by an exceptional event, a preliminary flag is submitted for the measurement in the AQS. The data are not official until they undergo more thorough quality assurance and quality control, leading to certification by May 1st of the year following the calendar year in which the data were collected (40 CFR 58.15(a)(2)). The presence of the flag can be confirmed in AQS.

Notify EPA of intent to flag through submission of initial event description by July 1 of calendar year following event (40 CFR 50.14(c)(2)(iii))

ADEQ submitted a letter to EPA Region 9 Air Division Director, Deborah Jordan, on September 11, 2013, notifying EPA of ADEQ's intent to flag data in AQS and submit documentation to EPA by

February 2014 for multiple exceptional events. EPA was later notified with subsequent communication via email that the October 9, 2013, exceptional event would be added to the other exceptional events specified in the September 11, 2013, letter. This assessment report serves as the demonstration supporting the flagging of these data. One Maricopa County monitor has been flagged as exceeding the 24-hour PM10 standard as a result of the high wind exceptional event:

West Chandler (04-013-4004-81102-1)

Document that the public comment process was followed for event documentation (40 CFR 50.14(c)(3)(iv))

ADEQ posted this assessment report on the ADEQ webpage and placed a hardcopy of the report in the ADEQ Records Management Center for public review. ADEQ opened a 30-day public comment period on 01/13/2014. A copy of the public notice certification, along with any comments received, will be submitted to EPA, consistent with the requirements of 40 CFR 50.14(c)(3)(iv). See Appendix C for a copy of the affidavit of public notice.

Submit demonstration supporting exceptional event flag (40 CFR 50.14(a)(1-2))

At the close of the comment period, and after ADEQ has had the opportunity to consider any comments submitted on this document, ADEQ will submit this document, the comments received, and ADEQ's responses to those comments to EPA Region IX headquarters in San Francisco, California. The deadline for the submittal of this demonstration package is December 31, 2016.

Documentation Requirements

Section 50.14(c)(3)(iii) of the EER states that in order to justify excluding air quality monitoring data, evidence must be provided for the following elements:

a. The event satisfies the criteria set forth in 40 CFR 501(j) that:
   (1) The event affected air quality,
   (2) The event was not reasonably controllable or preventable, and
   (3) The event was caused by human activity unlikely to recur in a particular location or was a natural event;
b. There is a clear causal relationship between the measurement under consideration and the event;
c. The event is associated with a measured concentration in excess of normal historical fluctuations; and
d. There would have been no exceedance or violation but for the event.

Section II of this assessment introduces the conceptual model of the low pressure system wind event that transpired on October 9, 2013, providing a background narrative of the exceptional event and an overall explanation that 'the event affected air quality'. Further evidence that 'the event affected air quality' is provided in Section V. Sections II and V also provide evidence that the event was a natural event.

Section IV of this assessment details the existing area control measures and demonstrates that despite the presence and enforcement of these controls, the event on October 9, 2013, was not reasonably controllable or preventable.

Section V of this assessment establishes a clear causal relationship between the natural event on October 9, 2013, and the exceedance of the 24-hour PM10 standard at the West Chandler monitoring station. The evidence in this section (and the previous section on historical fluctuations) also confirms that the event in question both affected air quality and was the result of a natural event.

Section III of this assessment provides data summaries and time series graphs which help illustrate that the event on October 9, 2013, produced PM10 concentrations in excess of normal historical fluctuations.

Section VI of this assessment builds upon the demonstration showing a clear causal relationship between the natural event and the exceedance and concludes there would have been no exceedance on October 9, 2013, but for the presence of the natural event.

II. CONCEPTUAL MODEL

Geographic Setting and Climate

Geographic Setting

Phoenix is located in the Salt River Valley in south-central Arizona. It lies at a mean elevation of 1,090 feet above mean sea level (msl) in the northeastern part of the Sonoran Desert. Other than the mountains in and around the city, the topography of Phoenix is generally flat. The Phoenix area is surrounded by the McDowell Mountains (~4,200 ft msl) to the northeast, the foothills of the Bradshaw (~7,900 ft msl) and Mazatzal (~7,900 ft msl) ranges to the north, the White Tank Mountains (~4,500 ft msl) to the west, the Sierra Estrella (~4,450 ft msl) to the southwest, and the Superstition Mountains (~5,000 ft msl) far to the east. Within the City are the Phoenix Mountains (~2,600 ft msl) and South Mountain (~2,600 ft msl). Current development is pushing north, west, and south into Pinal County. The Phoenix metropolitan area contains a fairly dense network of PM10 monitors throughout the area, with a much less dense network of monitors located throughout the rest of the state. Figure 2–1 shows the general geographic setting of Phoenix, as well as the locations of PM10 monitors throughout the state. It should be noted that some of the monitors shown in Figure 2-1 are filter-based monitors; therefore, monitoring data from all locations may only be available for select days (i.e. 1-in-6 run days).

Figure 2–2 depicts the drainage systems or watersheds for the State of Arizona. Many of the rivers that form Arizona's drainage system are dry for most of the year and, consequently, are sources of silt and fine soils that become suspended and add to regional PM10 loadings during high wind events. Much of this alluvial matter and fine soil is deposited in the low lying areas of central and southern Arizona, with larger depositional areas focused in and around the confluences of dry river channels.

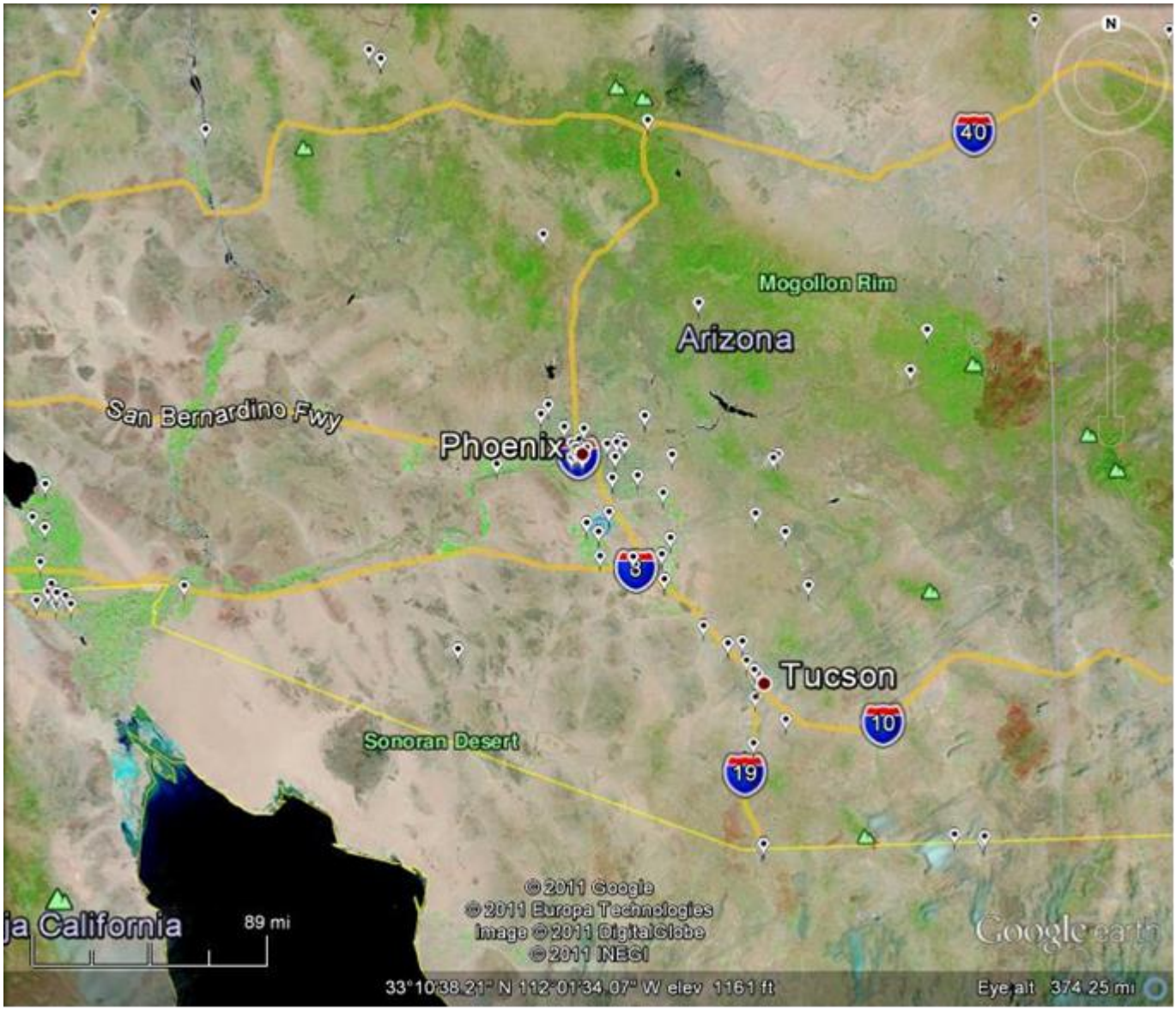


Figure 2-1. Phoenix Geographic Setting and PM10 Monitor Locations (source: EPA AQS DataMart, NASA MODIS Satellite, and Google Earth). PM10 monitor locations are indicated by white markers.

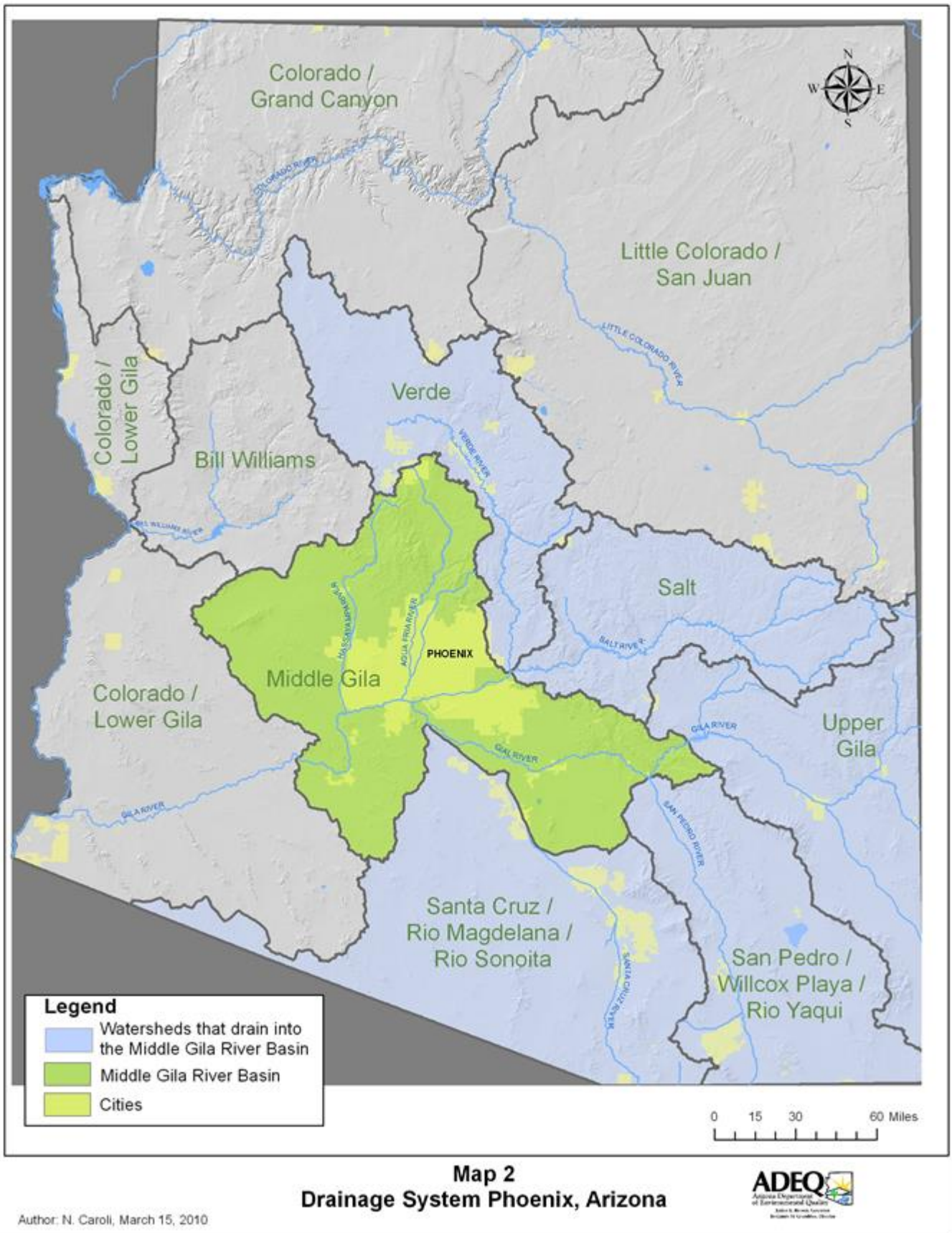


Figure 2-2. Drainage System of Phoenix, Arizona.

Climate

Phoenix has an arid climate, with very hot summers and temperate winters. The average summer high temperature is among the hottest of any populated area in the United States. The temperature reaches or exceeds 100ºF an average of 110 days during the year and highs top 110ºF an average of 18 days during the year. Phoenix receives an average of 7.66 inches of rain per year.

Precipitation is sparse during the first part of the summer, but the influx of monsoonal moisture, which generally begins in early July and lasts until mid-September, raises humidity levels and can cause heavy localized precipitation and flooding. Although thunderstorms are possible at any time of the year, they are most common during the monsoon season from July to mid-September as humid air is advected from the Gulf of California, Gulf of Mexico, and large thunderstorm complexes from the Sierra Madre Occidental Mountains in Mexico. This influx in moisture, combined with intense solar heating, often creates a very unstable environment that is ripe for thunderstorm development. These thunderstorms can bring strong winds and blowing dust, large hail, and heavy rain. Dust storms associated with these thunderstorms typically occur in the early part of the monsoon season (July) before soaking rains help keep soil particles bound to one another. However, depending on the amount of precipitation received during the monsoon season, extremely hot temperatures act to dry out the surface quickly, and dust storms can occur at any time. During the December through March period, winter storms moving inland from the Pacific Ocean can bring strong winds, blowing dust and significant rains throughout Arizona. This December – March time period, and July – August time period are typically the wettest parts of the year. Meanwhile, a distinct dry season occurs during the period April through June for Phoenix and the rest of Arizona. While these weather patterns describe the general climatology for the Phoenix area over a long period of time, Phoenix and the entire state of Arizona is also prone to a high degree of variability in these weather patterns from year to year.

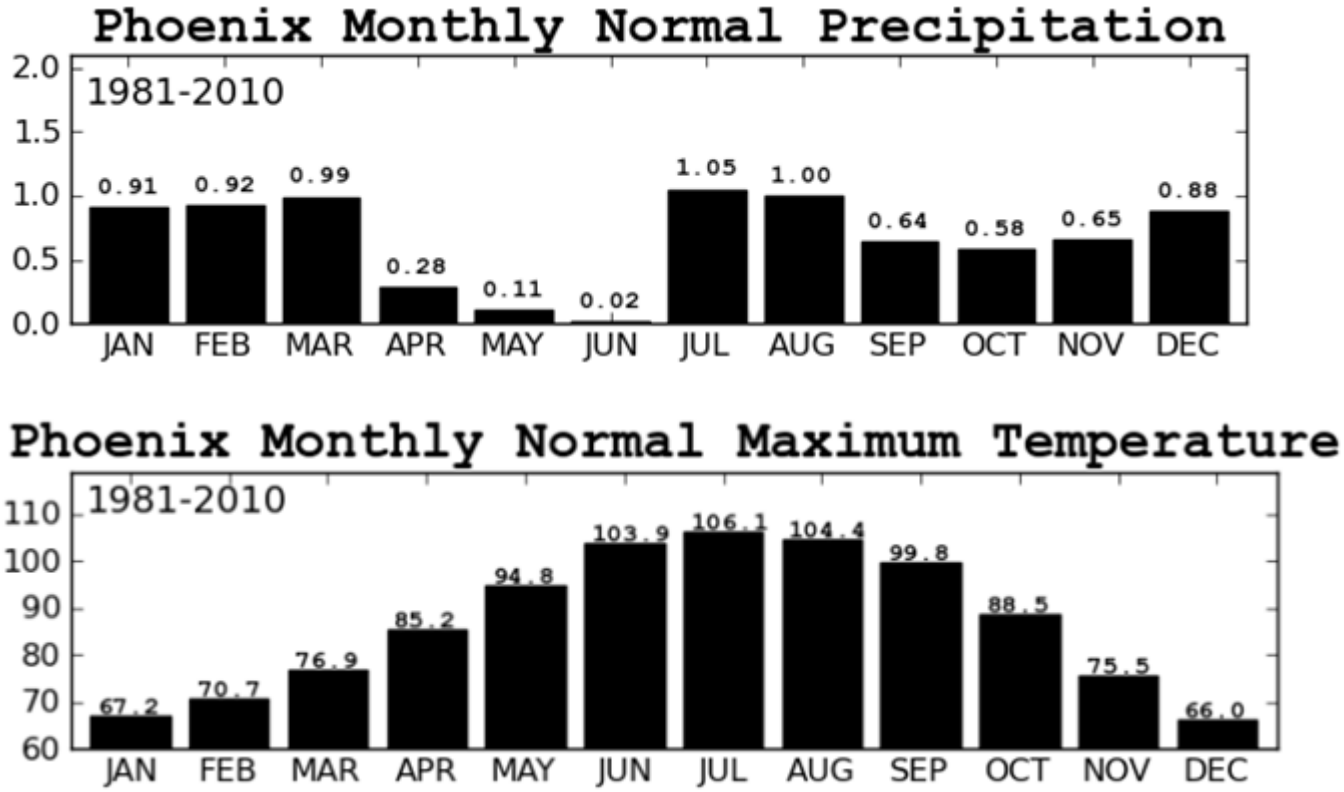


Figure 2-3 Phoenix Monthly Precipitation (top) and Maximum Temperature (bottom) Climatology (source: National Weather Service).

Low Pressure System Dust Storm Event Summary

In response to the approaching low pressure system and cold front on October 9, 2013, the National Weather Service (NWS) issued a wind advisory and a blowing dust advisory effective from 11:00 AM to 9:00 PM across most of the southwest deserts of Arizona, including areas within the Maricopa County PM10 nonattainment area. Sustained winds between 25 to 35 mph were expected, along with gusts up to 45 mph. Visibilities were predicted to drop to one mile or less, especially near open fields. Figure 2–4 displays the approaching system before it enters Arizona on October 9, 2013. Wind fields associated with the passing of the low pressure system are displayed in Figure 2–5.

By 11:30 AM, southwest winds of 20 mph, with gusts up to 30 mph, from the approaching low pressure system begin to produce windblown dust emissions in Pinal County. These winds increased in strength over the next few hours, culminating with the NWS issuing a dust storm warning for Pinal County at 1:28 PM for the afternoon and evening of October 9, 2013. From 2:00 PM to 6:00 PM, the southeast portion of the Maricopa County PM10 nonattainment area, directly north of Pinal County, experienced the brunt of the dust storm generated by the low pressure system winds, though the more rural western portions of Maricopa County also experienced blowing dust. Southwest winds as high as 30 mph, with gusts up to 44 mph, were recorded during this period in the southeast portion of Maricopa County. Five-minute average PM10 concentrations as high as 2,100 µg/m3 were recorded at the West Chandler monitor and visibilities were reduced to 4.0 miles at the nearby Chandler Municipal Airport. The source region for this dust storm is primarily the desert and open areas of Pinal County, evidenced by the exceedance of six Pinal County monitors. Visibilities in the source region of the dust storm were as low as 1.5 miles, as recorded at the Casa Grande Airport.

The location of the West Chandler monitor (directly downwind of open and desert areas) subjected the monitor to increased transport from the source region of Pinal County, ultimately causing the monitor to exceed the 24-hour PM10 standard. As seen in Figure 2–6, moderate and severe drought conditions in Maricopa and Pinal counties likely exacerbated the amount of dust the low pressure system winds were able to entrain. No precipitation was recorded at area NWS stations in conjunction with the passing of this low pressure system.

As a summary of the event, Figure 2–7 displays an hourly graph of PM10 concentrations throughout Maricopa County and the nonattainment area. Table 2–1 contains PM10 concentration data from all recorded monitors throughout the State of Arizona.

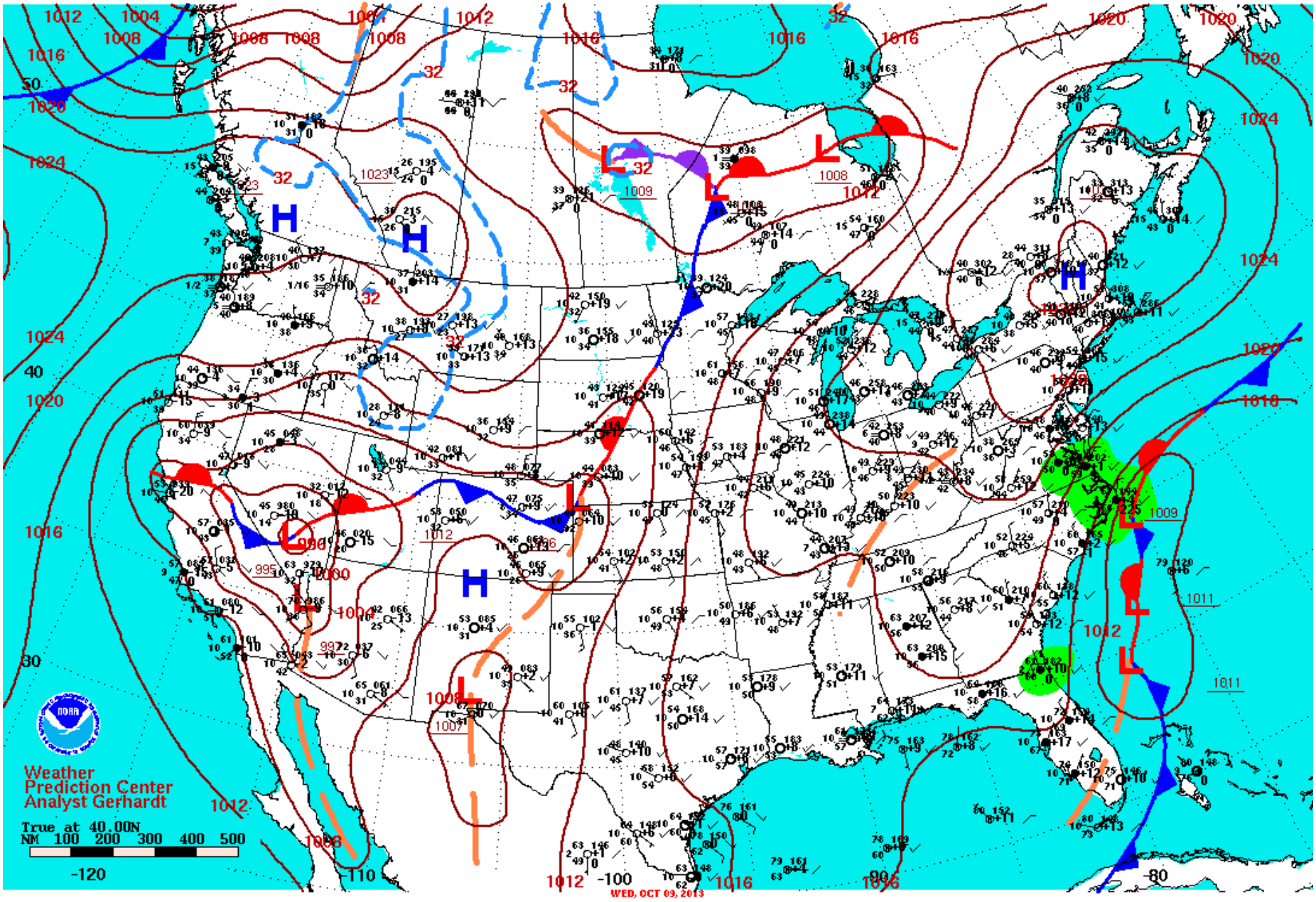


Figure 2-4 Location of low pressure system and cold front as of 5:00 AM Arizona time on October 9, 2013 (NOAA Daily Weather Map).

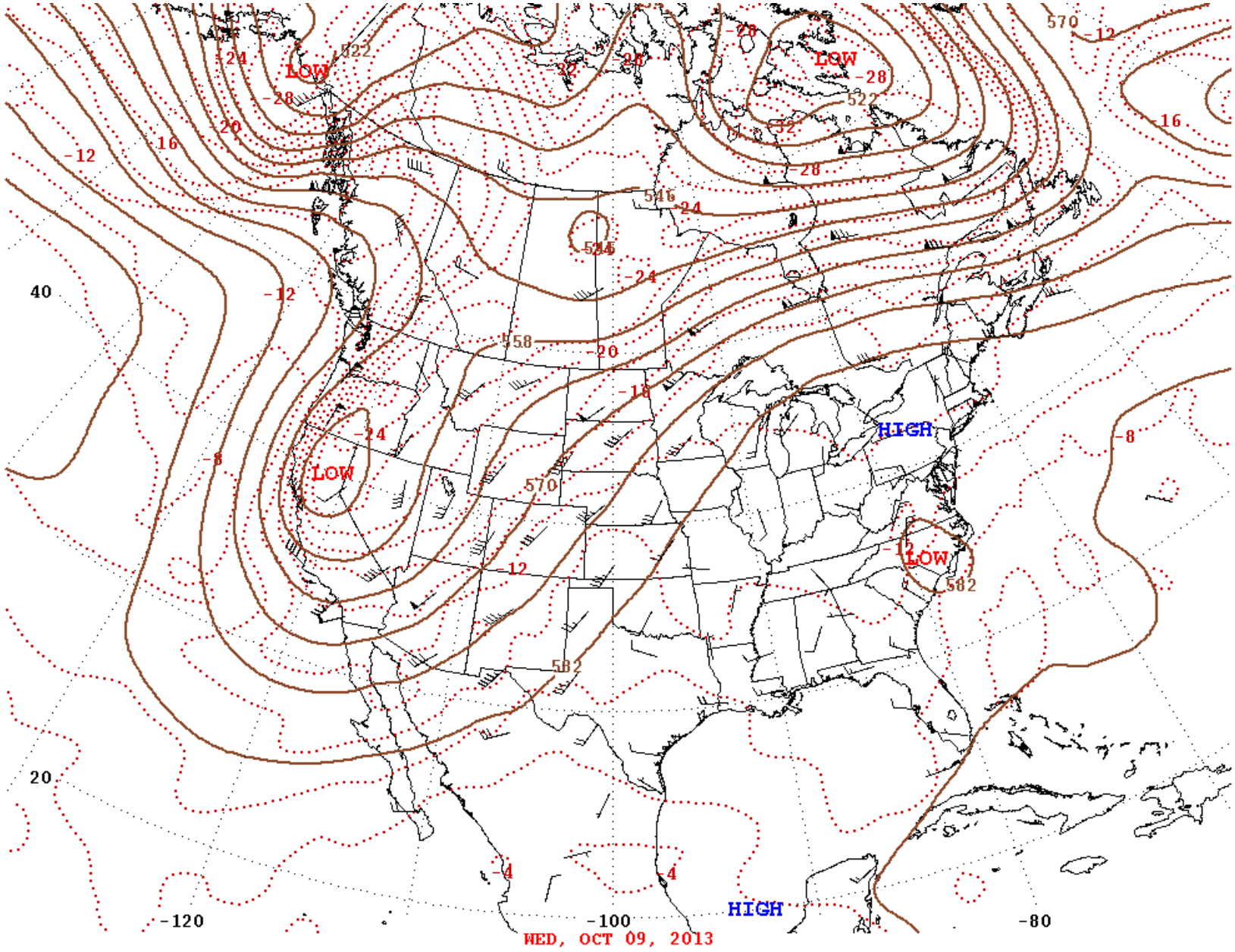


Figure 2-5. 500-Millibar wind field at 5:00 AM Arizona time on October 9, 2013 (NOAA Daily Weather Map).

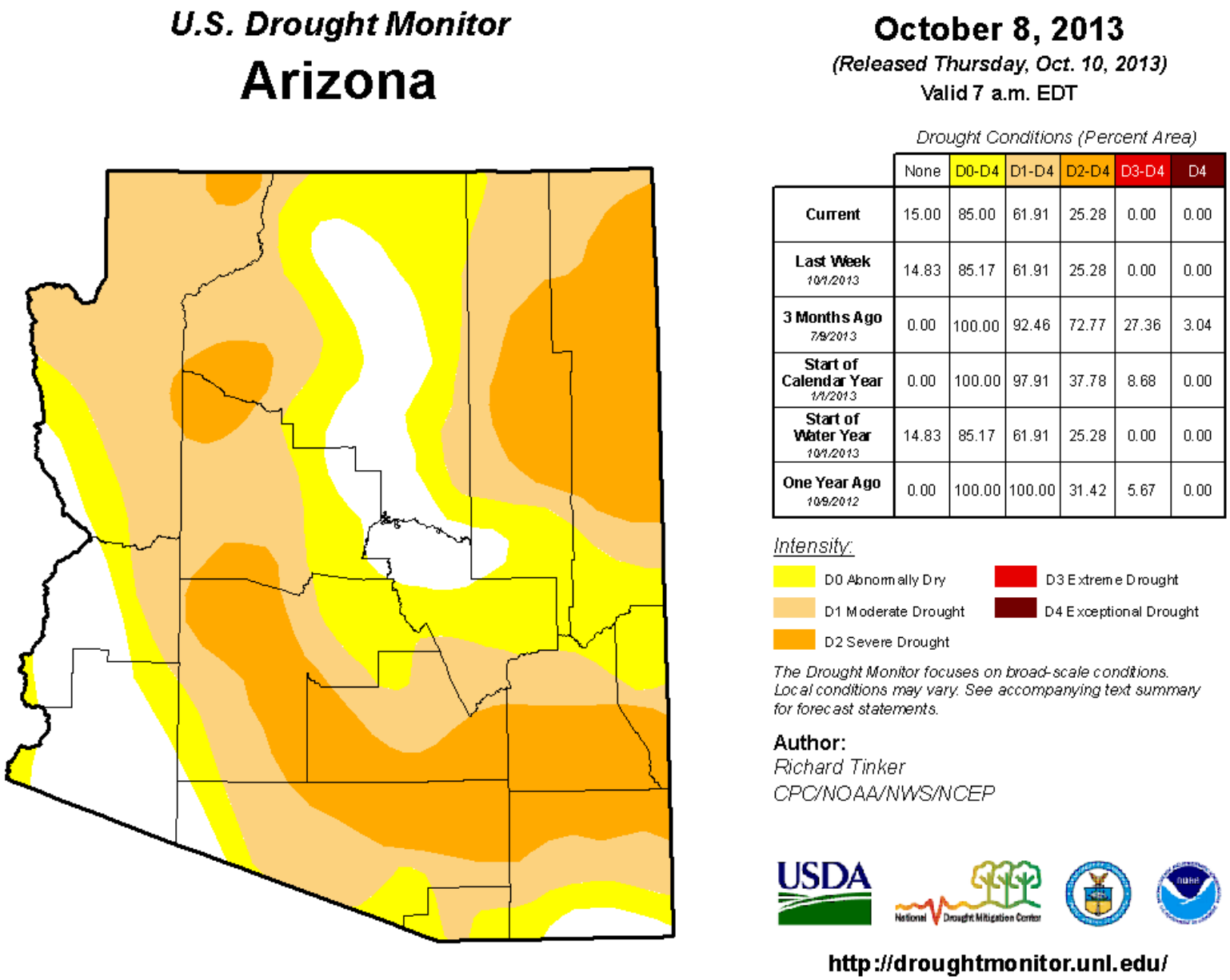


Figure 2-6. U.S. Drought Monitor analysis of Arizona released around the time period of the exceedance described in this report.

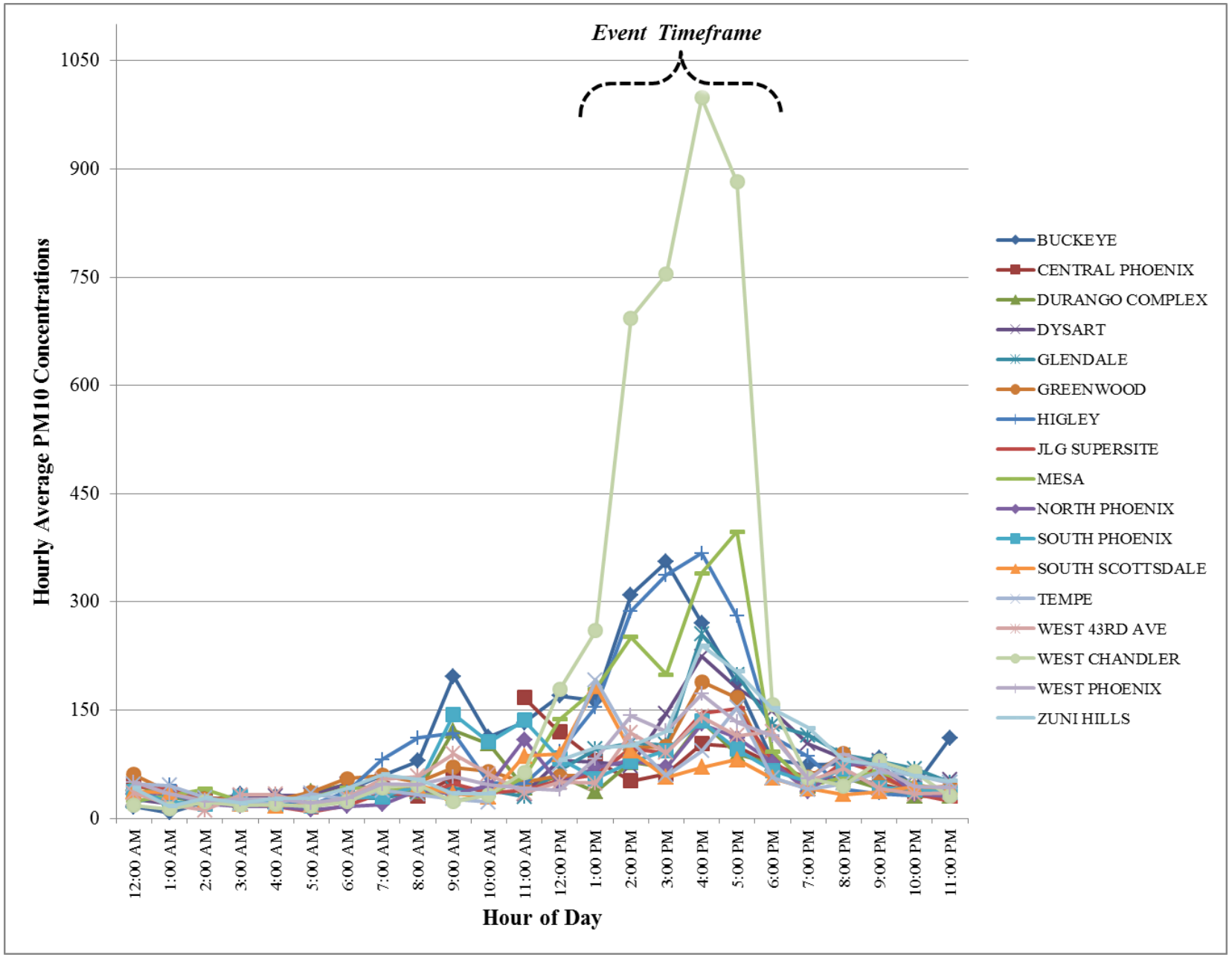


Figure 2-7. Timeline of PM10 concentrations at monitors in Maricopa County and the PM10 nonattainment area on October 9, 2013.

Table 2-1. Summary of Statewide PM10 Measurements for October 9, 2013.

Monitor	Monitor Type	Operator	AQS Monitor ID	24-hr Avg PM10 (µg/m^3)	1-hr Max PM10 (µg/m^3)	Max Time	AQS Qualifier Flag
Apache County							
N/A	N/A	WMAT	04-001-1003-81102-1	N/A	N/A	N/A	
Coconino County							
N/A	N/A	ADEQ	04-005-1237-81102-1	N/A	N/A	N/A	
Gila County[1]							
Hayden Old Jail	TEOM	ADEQ	04-007-1001-81102-3	113	371	0700	
Maricopa County[1]							
Buckeye	TEOM	MC	04-013-4011-81102-1	111	355	1500	
Central Phoenix	TEOM	MC	04-013-3002-81102-4	57	167	1100	
Durango Complex	TEOM	MC	04-013-9812-81102-1	55	134	1600	
Dysart	TEOM	MC	04-013-4010-81102-1	74	224	1600	
Fort McDowell/ Yuma Frank	TEOM	FMIR	04-013-5100-8112-3	N/A	N/A	N/A	
Glendale	TEOM	MC	04-013-2001-81102-1	70	254	1600	
Greenwood	TEOM	MC	04-013-3010-81102-1	66	189	1600	
Higley	TEOM	MC	04-013-4006-81102-1	102	367	1600	
JLG Supersite	BAM	ADEQ	04-013-9997-81102-3	53	152	1700	
JLG Supersite	TEOM	ADEQ	04-013-9997-81102-4	N/A	N/A	N/A	
Lehi Air Monitoring Station	N/A	SRP-MIC	04-013-7022-81102-1	N/A	N/A	N/A	
Mesa	TEOM	MC	04-013-1003-81102-1	94	397	1700	
North Phoenix	BAM	MC	04-013-1004-81102-1	51	131	1600	
Senior Center Air Monitoring Station	N/A	SRP-MIC	04-013-7020-81102-1	N/A	N/A	N/A	
Senior Center Air Monitoring Station	N/A	SRP-MIC	04-013-7020-81102-2	N/A	N/A	N/A	
South Phoenix	TEOM	MC	04-013-4003-81102-1	61	144	0900	
South Scottsdale	TEOM	MC	04-013-3003-81102-1	52	183	1300	
Tempe	TEOM	MC	04-013-4005-81102-1	58	191	1300	
West Chandler	**TEOM**	**MC**	**04-013-4004-81102-1**	**189**	**998**	**1600**	**RJ**
West Forty Third	TEOM	MC	04-013-4009-81102-1	58	141	1600	
West Phoenix	BAM	MC	04-013-0019-81102-1	64	172	1600	
Zuni Hills	TEOM	MC	04-013-4016-81102-1	77	239	1600	
Navajo County							
N/A	N/A	WMAT	04-017-1002-81102-1	N/A	N/A	N/A	
Pima County[1]							
Ajo	TEOM	ADEQ	04-019-0001-81102-3	59	135	1400	
Orange Grove	FRM	PCDEQ	04-019-0011-81102-2	N/A	N/A	N/A	
Prince Road	FRM	PCDEQ	04-019-1009-81102-1	N/A	N/A	N/A	
Rillito	TEOM	ADEQ	04-019-0020-81102-3	186	809	1400	RJ
Santa Clara	FRM	PCDEQ	04-019-1026-81102-1	N/A	N/A	N/A	
Tangerine	FRM	PCDEQ	04-019-1018-81102-1	N/A	N/A	N/A	
Pinal County[2]							
Apache Junction Fire Station	FRM	PCAQCD	04-021-3002-81102-3	N/A	N/A	N/A	
Bapchule	FRM	GRIC	04-021-7004-81102-1	N/A	N/A	N/A	
Bapchule	FRM	GRIC	04-021-7004-81102-2	N/A	N/A	N/A	
Casa Grande Downtown	TEOM	PCAQCD	04-021-0001-81102-3	174	703	1300	
Combs School	TEOM	PCAQCD	04-021-3009-81102-3	180	785	1300	
Cowtown	TEOM	PCAQCD	04-021-3013-81102-3	247	1,068	1800	
Maricopa	TEOM	PCAQCD	04-021-3010-81102-3	N/A	530	1500	
Pinal Air Park	TEOM	PCAQCD	04-021-3007-81102-3	155	757	1000	
Pinal County Housing	TEOM	PCAQCD	04-021-3011-81102-3	242	957	1500	
Stanfield	TEOM	PCAQCD	04-021-3008-81102-3	388	1,965	1400	
Santa Cruz County[1]							
Nogales Post Office	BAM	ADEQ	04-023-0004-81102-3	76	205	1100	

Monitor	Monitor Type	Operator	AQS Monitor ID	24-hr Avg PM10 ($\mu g/m^3$)	1-hr Max PM10 ($\mu g/m^3$)	Max Time	AQS Qualifier Flag
Yuma County[1]							
Yuma Supersite	TEOM	ADEQ	04-027-8011-81102-3	151	274	0100	

SOURCE: [1]ADEQ's AZURITE database. [2]Pinal County Air Quality Control District (PCAQCD). These data are preliminary and should not be considered final until entered into EPA's Air Quality System (AQS).

TEOM: Tapered Element Oscillating Microbalance monitor
BAM: Beta Attenuation monitor
FRM: Federal Reference Method
WMAT: White Mountain Apache Tribe of Fort Apache Reservation, AZ
SRP-MIC: Salt River Pima-Maricopa Indian Community of Slat River Reservation, AZ
PCDEQ: Pima County Department of Environmental Quality
PCAQCD: Pinal County Air Quality District
GRIC: Gila River Indian Community
RJ: qualifier flag for high winds

III. HISTORICAL FLUCTUATIONS

Figure 3–1 displays a time series plot of the 24-hour PM10 concentrations for the period January 1, 2008, through October 31, 2013, for the exceeding West Chandler monitor. The figure indicates that the PM10 concentrations seen at the West Chandler monitor on October 9, 2013 were in excess of normal historical fluctuations.

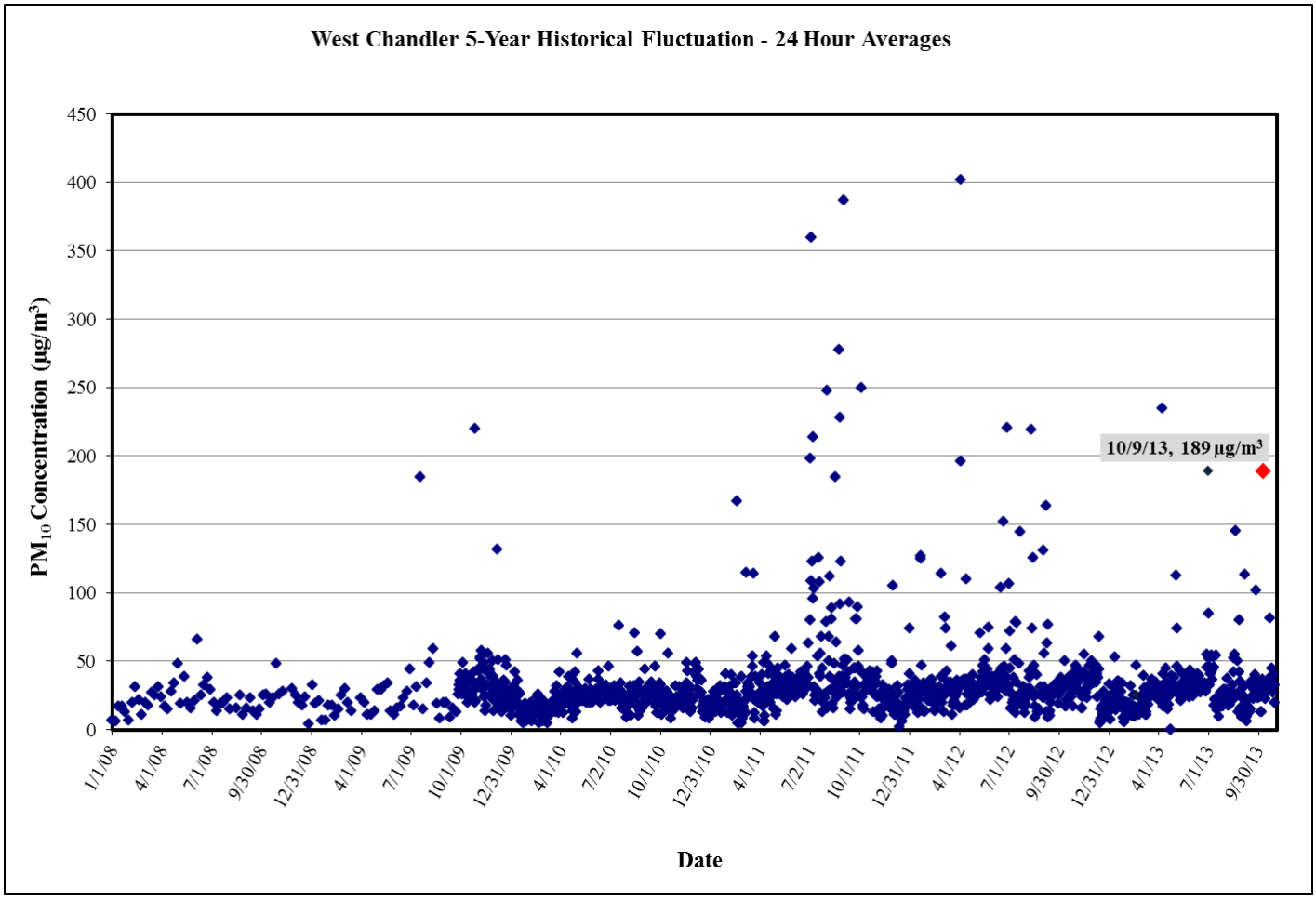


Figure 3-1. Plot of 24-hour average PM10 concentrations (January 2008 – October 2013) at the West Chandler monitor.

IV. NOT REASONABLY CONTROLLABLE OR PREVENTABLE

Section 50.1(j) of Title 40 CFR Part 50 requires that an event must be "not reasonably controllable or preventable" in order to be defined as an exceptional event. This requirement is met by demonstrating that despite reasonable control measures in place within Maricopa County and the nonattainment area, high wind conditions overwhelmed all reasonably available controls. The event occurring on October 9, 2013, was directly related to strong and gusty winds generated by a low pressure storm system.

As shown in Section V, strong sustained winds up to 30 mph and gusts up to 44 mph overwhelmed local controls, generating and transporting windblown dust throughout the nonattainment area. Transported windblown dust from the desert source region of Pinal County caused the southeast portion of the nonattainment area to experience the highest concentrations of PM10; ultimately leading to the exceedance recorded at the West Chandler monitor located immediately downwind of the source region of the dust storm.

Strict controls on local sources of fugitive dust were in place and enforced during the event on October 9, 2013, but were ultimately overwhelmed by strong and gusty low pressure system winds. The following sections describe the BACM- and MSM-level PM10 control measures in place on October 9, 2013, and the robustness of the programs designed to enforce these measures. Inspections of local sources performed before, during and after October 9, 2013, confirmed that no unusual anthropogenic PM10-producing activities occurred in Maricopa County, the nonattainment area, nor the local areas surrounding the exceeding monitors.

Regulatory Measures and Control Programs

The Arizona Department of Environmental Quality (ADEQ) and the Maricopa County Air Quality Department (MCAQD) are responsible for implementing regulatory measures to control emissions from agricultural sources, stationary sources, fugitive dust sources, and open burning within Maricopa County. Three major programs provide or contribute to air pollution control measures for the Greater Phoenix area. These programs include:

1.) ADEQ's Agricultural Best Management Program (AgBMP)
2.) Maricopa County's Inspection and Compliance Program
3.) ADEQ's Air Quality Forecasting Program

Specifically, ADEQ is responsible for compliance assistance and enforcement of Agricultural Best Management Practices developed by the Governor's Agricultural Best Management Practices Committee, while MCAQD is responsible for compliance assurance for all other significant sources of PM10 emissions. In addition to routine inspections and inspections driven by complaints, inspections are often increased when 1.) ADEQ forecasters issue a High Risk for the Maricopa County Dust Control Forecast, 2.) ADEQ forecasters issue a High Pollution Advisory, or 3.) near real-time monitoring data indicate unique activity via high PM concentrations. The forecasting program and inspection / compliance programs work together so that resources can be best utilized during days that are of greatest risk for elevated PM emissions.

On July 25, 2002, EPA took initial action to finalize approval of the Best Available Control Measure (BACM) and the Most Stringent Measure (MSM) demonstrations in the Serious Area PM10 plan for the Maricopa County portion of the metropolitan Phoenix PM10 nonattainment area (67 FR 48718). These BACM and MSM demonstrations were again approved by EPA on July 14, 2006 (71 FR 43979). The Agricultural Best Management Practices General Permit rule and related definitions have been approved into the Arizona Administrative Code as R18-2-610 and R18-2-611 pursuant to Arizona Revised Statutes § 49-457[1] . Maricopa County regulations of PM10 emissions are listed in Table 4-1.

Table 4-1. Rules and Ordinances Regulating Particulate Matter Emissions in Maricopa County.

Rule/Ordinance Number & Title	Description
Rule 300: Visible Emissions	Establishes standards for visible emissions and opacity.
Rule 310: Fugitive Dust from Dust-Generating Operations	Establishes limits for the emissions of particulate matter into the ambient air from any property, operations, or activity that may serve as a fugitive dust source.
Rule 310.01: Fugitive Dust from Non-Traditional Sources of Fugitive Dust	Establishes limits for the emissions of particulate matter into the ambient air from open areas, vacant lots, unpaved parking lots, and unpaved roadways which are not regulated by Rule 310 and which are not required to have either a permit or a dust control plan.
Rule 311: Particulate Matter from Process Industries	Establishes emission rates based on process weight applicable to any affected operations not subject to Rule 316.
Rule 312: Abrasive Blasting	Establishes limits for particulate emissions from abrasive blasting operations.
Rule 314: Open Outdoor Fires and Indoor Fireplaces at Commercial and Institutional Establishments	Establishes limits for the emissions of air contaminants produced from open burning.
Rule 316: Nonmetallic Mineral Processing	Establishes limits for the emissions of particulate matter into the ambient air from any nonmetallic mining operation or rock product processing plant.
Rule 317: Hospital/Medical/ Infectious Waste Incinerators	Establishes limits for the emissions of air pollutants from medical waste incinerators.
Rule 322: Power Plant Operations	Establishes limits for the emissions of nitrogen oxides, sulfur oxides, carbon monoxide and particulate matter from existing power plants and cogeneration plants.
Rule 323: Fuel Burning Equipment from Industrial/Commercial/ Institutional (ICI) Sources	Establishes limits for the emissions of nitrogen oxides, sulfur oxides, carbon monoxide and particulate matter from ICI sources.
Rule 324: Stationary Internal Combustion (IC) Engines	Establishes limits for the emissions of carbon monoxide, nitrogen oxides, sulfur oxides, volatile organic compounds, and particulate matter from stationary internal combustion engines, including stationary IC engines used in cogeneration.

[1] Updates to the AgBMP program in December, 2011, clarified BMPs for crop and added BMPs for animal operations. Effective 12/29/2011, R18-2-611 was renumbered to R18-2-610.0,1 **Agricultural PM10 General Permit for Crop Operations** and R18-2-611.01, **Animal Operations PM10 General Permit** was added. Definitions for Crop Operations were revised at R18-2-610 and new definitions for Animal Operations were added at R18-2-611.

Rule/Ordinance Number & Title	Description
Rule 325: Brick and Structural Clay Products (BSCP) Manufacturing	Establishes limits for particulate matter emissions from the use of tunnel kilns for curing in the brick and structural clay product (BSCP) manufacturing processes.
Ordinance P-25: Leaf Blower Restriction	Establishes restrictions for leaf blowers in incorporated and unincorporated sections of Area A in Maricopa County.
Ordinance P-26: Residential Woodburning Restriction	Establishes restrictions for residential woodburning.
Ordinance P-27: Vehicle Parking and Use on Unstabilized Vacant Lots	Establishes restrictions for vehicle parking and use on unstabilized vacant lots in unincorporated sections of Area A in Maricopa County.
Ordinance P-28: Off-Road Vehicle Use in Unincorporated Areas of Maricopa County	Establishes restrictions for operating vehicles on unpaved property in unincorporated areas of Maricopa County.
Arizona Administrative Code R18-2-611 & 610: Agricultural PM10 General permit	Establishes a requirement for commercial farmers to implement best management practices and maintain a record demonstrating compliance

In addition to the rules and regulations listed in the above table, other PM10 reducing control measures (e.g., paving of unpaved roads, PM10 certified street sweepers, controlling unpaved parking lots, etc.) have been committed to, and implemented by, local jurisdictions throughout the PM10 nonattainment area, and incorporated into the Arizona SIP through PM10 plans such as the Revised MAG 1999 Serious Area Particulate Plan for PM10 for the Maricopa County Nonattainment Area. The Pinal County Air Quality Control District (PCAQCD) also implements regulatory control measures on emissions from existing and new non-point sources within Pinal County (see Table 4-2). Additionally, the PCAQCD implements specific nonattainment rules for that part of the Phoenix PM10 nonattainment area that resides in Pinal County (see Table 4-3).

Table 4-2. Pinal County Rules Regulating Existing and New Non-point Sources in Pinal County.

Article Number & Title	Description
Article 2: Fugitive Dust	Provides a mechanism to reasonably regulate operations which periodically may cause fugitive dust emissions into the atmosphere
Article 3: Construction Sites – Fugitive Dust	Improves the control of excessive fugitive dust emissions that have been traditionally associated with construction, earthwork, and land development, and thereby minimize nuisance impacts

Table 4-3. Pinal County Rules Regulating Fugitive Dust in Pinal County Portion of MC PM10 NAA.

Article Number & Title	Description
Article 4: Nonattainment Area Rules; Dustproofing for Commercial Parking, Drives and Yards	Establishes rules to avoid violations of the prevailing PM10 standard and additionally minimize nuisance impacts by improving control of excessive fugitive dust emissions from unpaved parking lots
Article 5: Nonattainment Area Rules; Stabilization for Residential Parking and Drives	Establishes rules for stabilizing residential properties
Article 6: Restrictions on Vehicle Parking and Use on Vacant Lots	Establishes rules for unpaved or unstabilized vacant lots

Article Number & Title	Description
Article 7: Construction Sites in Nonattainment Areas – Fugitive Dust	Establishes rules to avoid violations of the prevailing PM10 standard and additionally minimize nuisance impacts by improving control of excessive fugitive dust emissions from activities associated with construction, earthwork, or land development.
Article 8: Nonattainment Area Rules, Requirement for Stabilization of Disturbed Areas at Vacant Lots	Establishes rules for stabilizing disturbed areas at vacant lots

PM10 Rule Effectiveness

MCAQD analyzed the effectiveness of its fugitive dust rules (Rules 310, 310.01 and 316) in terms of source compliance rates. The rule effectiveness study was designed to assess how many sources regulated by MCAQD during the subject time period received no PM10 emissions-related violations. As a basis for comparison, the percentage of sources that did not receive a PM10 emissions-related violation during calendar year 2007 was 76% for sources subject to Rule 310, 85% for sources subject to Rule 310.01, and 40% for sources subject to Rule 316. In early 2008, Rules 310, 310.01, and 316 were strengthened and new ordinances (covering additional source categories such as leaf blowers, vacant lots, and off-road vehicles) were adopted. These enhancements resulted from MCAQD's obligations under such agreements as the 2005 Revised PM10 State Implementation Plan for the Salt River Area and the Maricopa Association of Governments (MAG) 2007 Five Percent Plan for PM10 for the Maricopa County Nonattainment Area. Three major areas that contributed to increased compliance were an increase in departmental staffing (especially inspectors), a robust training program, and regulatory changes that broadened and strengthened control measures under Rules 310, 310.01, and 316.

Rule effectiveness rates were re-assessed for FY 2009 (July 2008–June 2009), a period that allowed time for the new and revised regulations to take effect. The results showed significant increases in compliance compared with the earlier period: to 90% (from 76%) for Rule 310 sources, to 95% (from 85%) for Rule 310.01 sources, and to 65% (from 40%) for Rule 316 sources. These improvements continued into calendar year 2010 with rule effectiveness rates of 94% for Rule 310 sources, 96% for Rule 310.01, and 73% for Rule 316 sources.

Additional rule effectiveness increases were observed for Rule 310.01 and Rule 316 in calendar year 2012. The increase in rule effectiveness for Rule 310.01 was attributed to ADEQ's Dust Action General Permit, which was a new dust measure contained in the 2012 Five Percent Plan for PM10 for the Maricopa County Nonattainment Area. The rule effectiveness for Rule 310.01 was 98%, an increase of 2% in 2012. The rule effectiveness for Rule 316 had a considerable increase to 83%, which is an increase of 10% compared to 2010.

The timeline below illustrates the improvements in rule effectiveness over the last several years, and also points out significant revisions to previous rules, as well as newly adopted rules, ordinances and measures. Since the first study of 2007, the rule effectiveness has increased for Rule 310, Rule 310.01, and Rule 316 by 17%, 13%, and 43%, respectively.

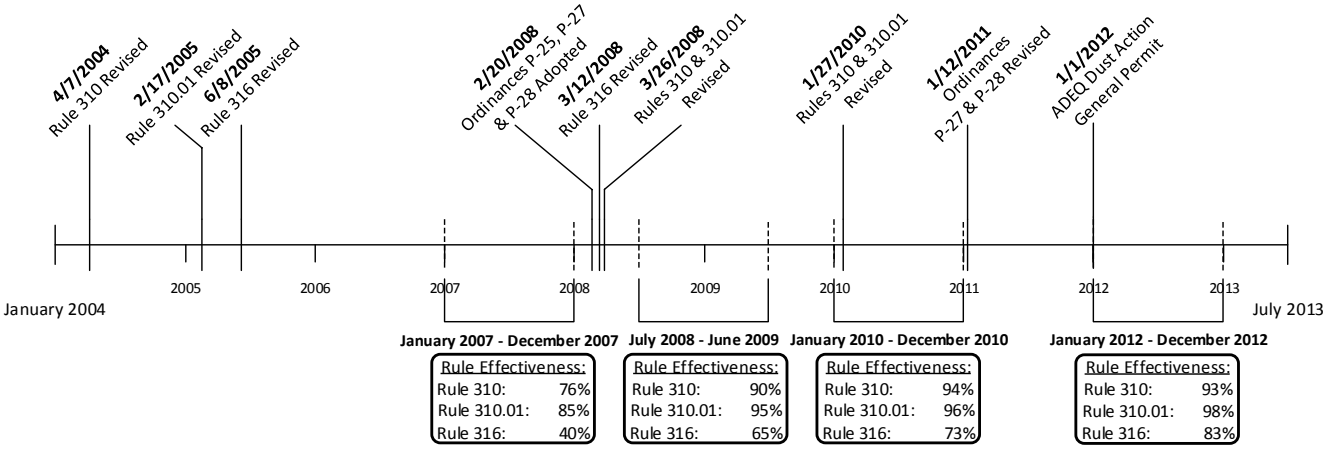


Figure 4-1. Timeline of Maricopa County fugitive dust rules and ordinances.

Compliance and Enforcement Activities

MCAQD is prepared to proactively respond to high wind events and protect human health and well-being. MCAQD's approach consists of two primary components: routine proactive inspections, as well as surveillance inspections, conducted both during and after significant events. MCAQD routinely inspects dust control-permitted sites and increases the frequency of inspections for permits covering areas of ten acres or more. Non-metallic surface mining sources under Rule 316 are also regularly inspected multiple times every year. Maricopa County also responds to the majority of air quality complaints within 24 hours.

Maricopa County monitors the ADEQ Five-Day Dust Control Forecast to identify the potential for elevated PM_{10} pollution levels due to high winds or stagnant conditions. When a High Pollution Advisory (HPA) is issued for Maricopa County, MCAQD conducts additional increased surveillance before, during, and after the forecast event(s). MCAQD also conducts event surveillance and post-event activities after an exceptional event that had not been forecast (i.e., those instances in which an HPA had not been issued).

Pre-event surveillance consists of surveying high-risk areas for any dust-generating activities, educating sources of the impending HPA event, and issuing violations for failure to comply with local, state, or federal regulations. During the event, MCAQD inspectors survey high-risk areas to confirm that control measures are in place, document any violations, and contact other regulatory agencies if necessary. Post-event activities include continued surveys of high-risk areas, re-inspecting sources within two business days of receiving a violation, and an internal MCAQD debriefing of event activities.

Currently, a total of 16 MCAQD air monitoring sites were upgraded with new equipment to allow the monitoring sites to automatically report monitored readings at 5-minute intervals. Previously, hourly readings were only available. The real-time data reporting system includes a mechanism to alert MCAQD inspectors when PM_{10} concentrations are elevated. The system allows MCAQD inspectors to review concentrations at the monitor and to consult the National Weather Service website to check for weather event activity. This capability allows the MCAQD responder to identify regional events and monitor specific issues. If necessary, the MCAQD responders can inform nearby stakeholders and local governments of the elevated PM10 concentrations.

For October 9, 2013, a Maricopa County Dust Control Forecast was issued indicating a high risk level for unhealthy PM10. The Dust Control Forecast indicated south and southwesterly winds of 25-35 mph with gusts near 45 mph. The forecast also advised of "lengthy periods of strong and gusty winds to a large area including the Phoenix area" which creates "a very high potential for significant blowing and transported dust episode."

An evaluation of all inspection reports, air quality complaints, compliance reports, and other documentation indicate no evidence of unusual anthropogenic-based PM10 emissions. During the time period of October 6 through October 12, 2013, MCAQD inspectors conducted a total of 217 inspections of permitted facilities, of which 177 were at fugitive dust sources. Additionally, MCAQD conducted 307 inspections on vacant lots and unpaved parking lots during this period.

During this 7-day period, a total of 34 violations were issued county-wide for PM10 and non-PM10-related violations. Violations were issued to two PM10 fugitive dust sources within a 4-mile radius of the exceeding West Chandler monitor.

MCAQD issued a violation to a fugitive dust source on October 7, 2013, for failing to have a water pull driver complete the basic dust control training class. The inspector noted the site was stable during the inspection and did not observe any fugitive dust emissions. The site was located approximately 1.5 miles to the east of the West Chandler monitor. The violation would not have contributed to the exceedance because there were no fugitive dust emissions and the source was located outside the wind profile of the West Chandler monitor.

Additionally, MCAQD issued a violation to a fugitive dust source on October 8, 2013, for unstable surface areas. The unstable surface area was relatively small and measured approximately 0.14 acres. The violation was corrected prior to the exceptional event by stabilizing the areas with water and erecting barriers. The source was located 1.98 miles southeast of the West Chandler monitor, which was outside of the wind profile of the monitor during the exceptional event. The violation would not have contributed to the exceedance at the monitor.

MCAQD was prepared for any complaints received due to the high wind event. During the 7-day period from October 6 through October 12, 2013, MCAQD received 6 complaints, of which none were windblown dust or PM10 related.

Based on a review of the inspection reports and site visit documentation, there is no evidence to suggest that agricultural activities within Maricopa County produced unusual or significant PM10 emissions. From October 6 through October 12, 2013, the ADEQ Ag BMP inspector received no complaints and completed one inspection. On the day of the exceedance the ADEQ Ag BMP inspector was in the field and noted that dust impacting the West Chandler monitor area appeared to derive from the south-southwest from the Gila River Indian Community and Pinal County where open desert, undeveloped lands, and agricultural lands exist. The agriculture fields in Maricopa County during that time of year have established crops of sorghum and alfalfa and would not have significantly contributed to PM10 emissions.

Conclusions

The strong and gusty low pressure system winds on October 9, 2013, overwhelmed local controls, generating and transporting enough windblown PM10 to cause an exceedance at the West Chandler monitor. Transported dust from the source region deserts of Pinal County contributed heavily to the exceedance at the West Chandler monitor, located immediately downwind of the source region. The

Maricopa County area is designated as a serious nonattainment area for PM10 and is required to have BACM for all significant sources of PM10. BACM-approved control measures on significant anthropogenic sources were in place and enforced during the events, and pro-active tracking and response to the events by regulatory agencies and local governments confirmed the uncontrollable nature of the dust emissions; therefore, these pre-existing/prior approved required controls are adequate for meeting the requirements of an exceptional event and should be considered "reasonable" for these purposes.

Despite the deployment of comprehensive control measures and sophisticated response programs, high wind conditions associated with the low pressure system generated and transported high concentrations of PM10 within the nonattainment area. Sustained winds up to 30 mph and gusts up to 44 mph easily overwhelmed all available efforts to limit PM10 concentrations from the event. The fact that this was a natural event involving a low pressure storm system that generated and transported PM10 emissions both within, and into the nonattainment area, provides strong evidence that the exceedance on October 9, 2013, recorded at the West Chandler monitor was not reasonably controllable or preventable.

V. CLEAR CAUSAL RELATIONSHIP

Introduction

A demonstration of the clear causal relationship between windblown dust generated and transported by low pressure system winds and the exceedance at the West Chandler monitor on October 9, 2013, is provided in this section. A strong, gusty low pressure system generated sustained winds up to 30 mph and gusts up to 44 mph in Maricopa and Pinal counties. The open and desert areas of Pinal County were particularly impacted by the strong winds, generating enough windblown dust to cause six monitors in the county to exceed. Transported dust from the desert source region of Pinal County caused the southeast portion of the nonattainment area to experience the highest levels of PM10 concentrations. The West Chandler monitor, located immediately downwind of the source region deserts, experienced the brunt of the transported dust leading to an exceedance of the 24-hour PM10 standard.

A detailed description of the meteorology that caused the natural windblown dust exceedance event at the West Chandler monitor is described below in a series of time-stamped maps. Visibility photos from within the nonattainment area provide additional temporal evidence of the link between the blowing dust from the low pressure system winds and high PM10 concentrations. The weight of evidence from these sources provides the clear causal relationship between the windblown dust generated and transported by low pressure storm system winds and the exceedance at the West Chandler monitor on October 9, 2013.

Time Series Maps and Visibility Photos

Figures 5–1 through 5–15 provide a time series GIS-based visualization of the meteorology and PM10 concentrations associated with the storm system. The data displayed in the following maps were gathered from five data sources. All available meteorological and air quality data was used in order to present the most complete story of the event. Table 5–1 displays the types of data used from each agency in creating the maps.

Table 5-1. Data Sets Used in the Creation of Time Series GIS Maps.

Agency	Data Sets
Arizona Department of Environmental Quality (ADEQ)	Hourly PM10 Concentrations, Wind Speed, Wind Direction and Wind Gusts
Arizona Meteorological Network (AZMET)	Hourly Wind Speed, Wind Direction and Wind Gusts
Maricopa County Air Quality Department (MCAQD)	5-Minute PM10 Concentrations, Wind Speed, Wind Direction, and Wind Gusts (hourly data used when 5-minute was unavailable)
Pinal County Air Quality Control District (PCAQCD)	Hourly PM10 Concentrations, 5-Minute and Hourly Wind Speed, Wind Direction and Wind Gusts
National Weather Service (NWS)	Point in Time Wind Speed, Wind Direction, Wind Gusts, and Visibility

Map Description

A description of each time series map is provided to highlight important data in each map and explain the progression of the meteorology and PM10 concentrations through time. Taken as a whole, the maps and associated explanatory text describe the clear causal relationship between the windblown dust generated

transported by the low pressure storm system winds and the PM10 exceedance at the West Chandler monitor.

11:30 AM – 12:00 PM

Winds from the southwest begin to cause increased PM10 concentrations in Pinal County. Conditions are breezy in the Maricopa County nonattainment area, with PM10 concentrations slightly elevated across the area.

12:00 PM – 12:30 PM

Significant PM10 concentration levels (over 1,000 $\mu g/m^3$) begin to be generated in Pinal County in response to sustained winds as high as 23 mph and wind gusts as high as 34 mph. A few monitors in the Maricopa County nonattainment area begin to record concentrations above 150 $\mu g/m^3$ under sustained winds as high as 16 mph and gusts as high as 34 mph.

12:30 PM – 1:00 PM

Sustained winds as high as 23 mph are recorded in the southeast portion of the nonattainment area, prompting the West Chandler monitor to record PM10 concentrations above 150 $\mu g/m^3$ for the whole period. Significant dust is still being generated in Pinal County, with the Casa Grande airport reporting visibility as low as 5.0 miles. Dust from Pinal County begins to be transported into the southeast portion of the nonattainment area on constant southwest winds.

1:00 PM – 1:30 PM

PM10 concentrations remain elevated in the southeast portion of the nonattainment area in response to more transported dust from Pinal County. Visibility is now only 3.0 miles at the Casa Grande airport in response to sustained winds of 28 mph and gusts of 41 mph.

1:30 PM – 2:00 PM

Sustained winds and gusts strengthen to 23 mph and 36 mph, respectively, in the southeast portion of the nonattainment area, transporting and generating additional PM10 concentrations. Visibility is now reduced to 4.0 miles at the Williams Gateway airport. The five easternmost Maricopa County monitors record PM10 concentrations above 150 $\mu g/m^3$, with the West Chandler monitor recording concentrations above 500 $\mu g/m^3$. During this period, the National Weather Service upgrades the blowing dust warning to a dust storm warning in Pinal County. The Casa Grande airport reports visibility of only 1.8 miles.

2:00 PM – 2:30 PM

PM10 concentrations remain elevated in the southeast portion of Maricopa County under sustained winds as high as 20 mph and gusts as high as 36 mph. Increased PM10 concentrations are also recorded in the western portion of Maricopa County as well. Pinal County remains the primary source of dust, with five monitors recording concentrations above 500 $\mu g/m^3$ and visibility reduced to 2.5 miles at the Casa Grande airport. Dominant, sustained winds from the southwest confine the transport of dust from Pinal County to the southeast portion of the Maricopa County nonattainment area.

2:30 PM – 3:00 PM

PM10 concentrations rise even further in the southeast portion of the nonattainment area in response to increasing sustained winds of 25 mph and gusts of 37 mph. Visibility is reduced to 4.0 miles at both the Chandler Municipal and Williams Gateway airports, and 5.0 miles at the Mesa/Falcon Field airport. Visibility has been reduced to 1.5 miles in the source region of Pinal County as reported at the Casa Grande airport. Reduced visibility of 5.0 miles is also noted at the western Buckeye Municipal Airport.

3:00 PM – 3:30 PM

Sustained winds from the southwest continue the trend of transporting dust from Pinal County to the southeast portion of the nonattainment area. PM10 concentrations remain most elevated at the West Chandler and Higley monitors. Visibility remain very poor (1.8 miles) in the source region of Pinal County in response to continual generation of PM10 above 500 $\mu g/m^3$ at monitors across the region.

3:30 PM – 4:00 PM

A burst of wind speed with sustained winds of 29 mph and gusts of 39 mph in the southeast portion of the nonattainment area generate additional PM10 concentrations, causing the West Chandler monitor to record PM10 concentration above 1,000 $\mu g/m^3$ for the first time during the wind event. Visibilities remained reduced to 4.0 miles at the Chandler Municipal and Williams Gateway airports. Strong winds from the west in the central portions of the nonattainment area help to keep the transported dust form Pinal County confined to the southeast portion of the nonattainment area and help explain why only the West Chandler monitor exceeded during the high wind event. Dust production has increased in the western portions of Maricopa County as well, reducing visibilities to 5.0 miles at the Buckeye Municipal and Luke Air Force Base airports. However, wind speeds in the western portion of Maricopa County are not as great as those experienced in Pinal County and the southeast portion of Maricopa County, allowing the desert areas around the western monitors to generate and transport less PM10 and thus avoid any PM10 exceedances.

4:00 PM – 4:30 PM

PM10 concentrations remain elevated in the southeast portion of Maricopa County in response to continual transport of PM10 from Pinal County. Dominant winds from the west in the central portions of Maricopa County continue to keep transported dust confined to the southeast portion of Maricopa County.

4:30 PM – 5:00 PM

Another burst of sustained winds as high as 30 mph and gusts as high as 38 mph generate and transport fresh PM10 to the exceeding West Chandler monitor, causing PM10 concentrations to remain above 1,000 $\mu g/m^3$ for this entire period. Visibility photos from the Superstition Mountain camera show widespread dust affecting the whole southeast region of Maricopa County. Visibilities remain reduced to 5.0 miles at the Chandler Municipal Airport and 4.0 at the Williams Gateway Airport.

5:00 PM – 5:30 PM

As PM10 concentrations finally begin to subside in the source region of Pinal County, the southeast portion of Maricopa County also begins to see reduced PM10 concentrations. Wind speeds are still breezy with gusts up to 30 mph, but the worst dust of the high wind event has passed.

5:30 PM – 6:00 PM

Visibility is restored to 10.0 miles at the Chandler Municipal airport and the Casa Grande airport as PM10 concentrations continue to drop to levels below 500 µg/m^3 throughout the region. As no new dust is generated from the wind event, the dominant southwest winds now help to blow out remaining PM10 from the region.

6:00 PM – 6:30 PM

Wind speeds abruptly drop during this period allowing almost all the Maricopa County monitors to record PM10 concentrations below 150 µg/m^3. Localized PM10 generation in Pinal County still occurs, but the wind speeds are no longer strong enough to transport the dust into the southeast portion of Maricopa County.

6:30 PM – 7:00 PM

With the passing of the high winds from the low pressure system, PM10 concentrations have largely returned to pre-dust event levels and will remain so for the remainder of the day.

24-Hour Summary Graphic

This 24-hour summary graphic is included to help explain why only the West Chandler monitor exceeded during the high wind event in the Maricopa County nonattainment area. The graphic includes the 24-hour average PM10 concentration, maximum sustained wind speed (with an averaged directional vector) during the event, and maximum wind gust during the event.

The graphic clearly shows that the source region of the dust during the high wind event was the open and desert areas of Pinal County. As can be seen on the satellite photo, the area immediately upwind of the West Chandler monitor is the open deserts of Pinal County and the Gila River Indian Community. The strongest sustained winds and gusts were predominantly located in Pinal County and the southeast portion of Maricopa County. While the Higley monitor is also located in the southeast portion of Maricopa County, there are several miles of housing and urbanized development immediately upwind of that monitor, which helped to both reduce maximum wind speeds and reduce the amount of transported dust from Pinal County that could reach the monitor. The centralized portion of Maricopa County had a wind trajectory more from the west, which helped to keep any transported dust from Pinal County east of these monitors. All of these factors help to explain why the West Chandler monitor exceeded during the high wind event and other Maricopa County monitors did not.

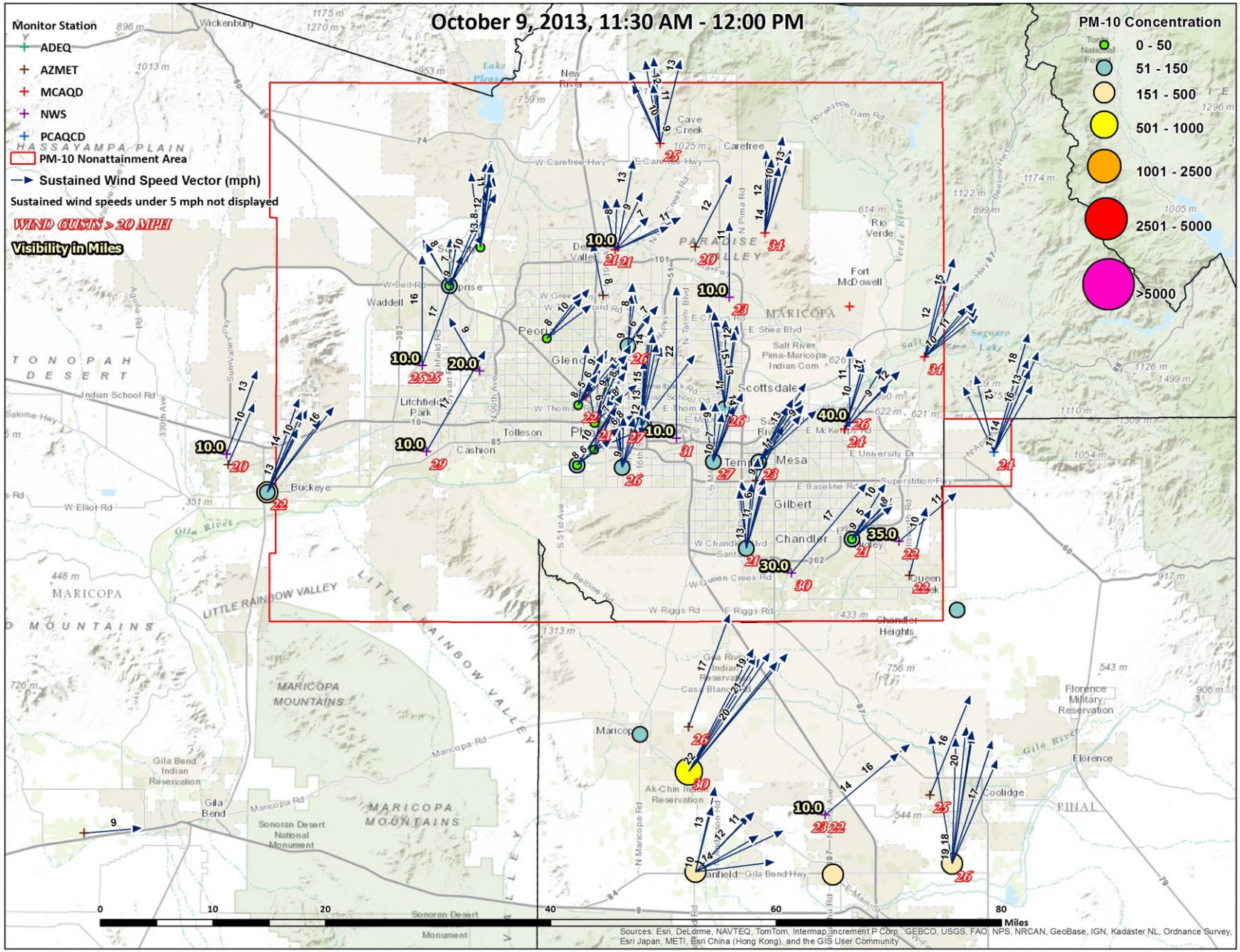


Figure 5-1. October 9, 2013, 11:30 AM – 12:00 PM.

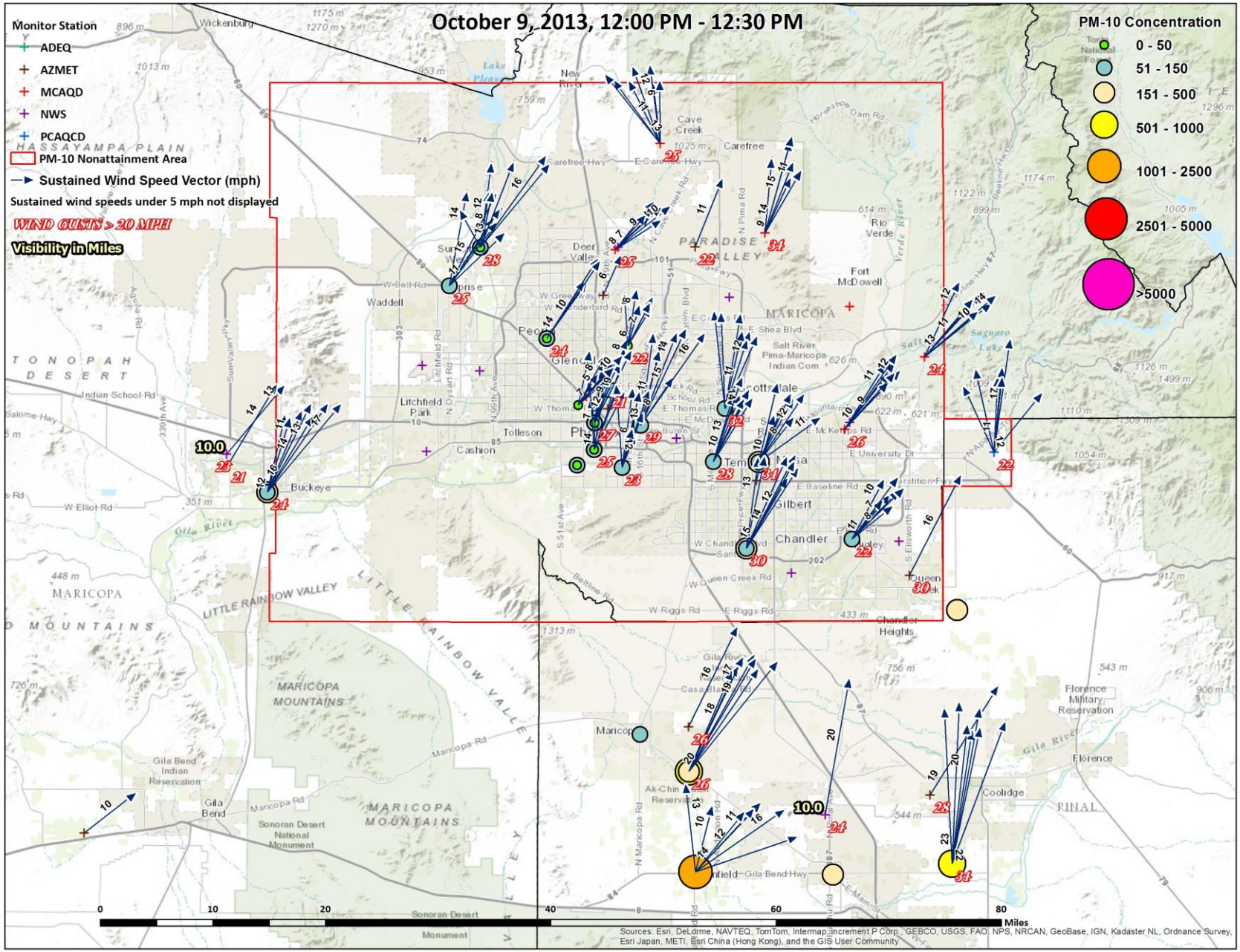


Figure 5-2. October 9, 2013, 12:00 PM – 12:30 PM.

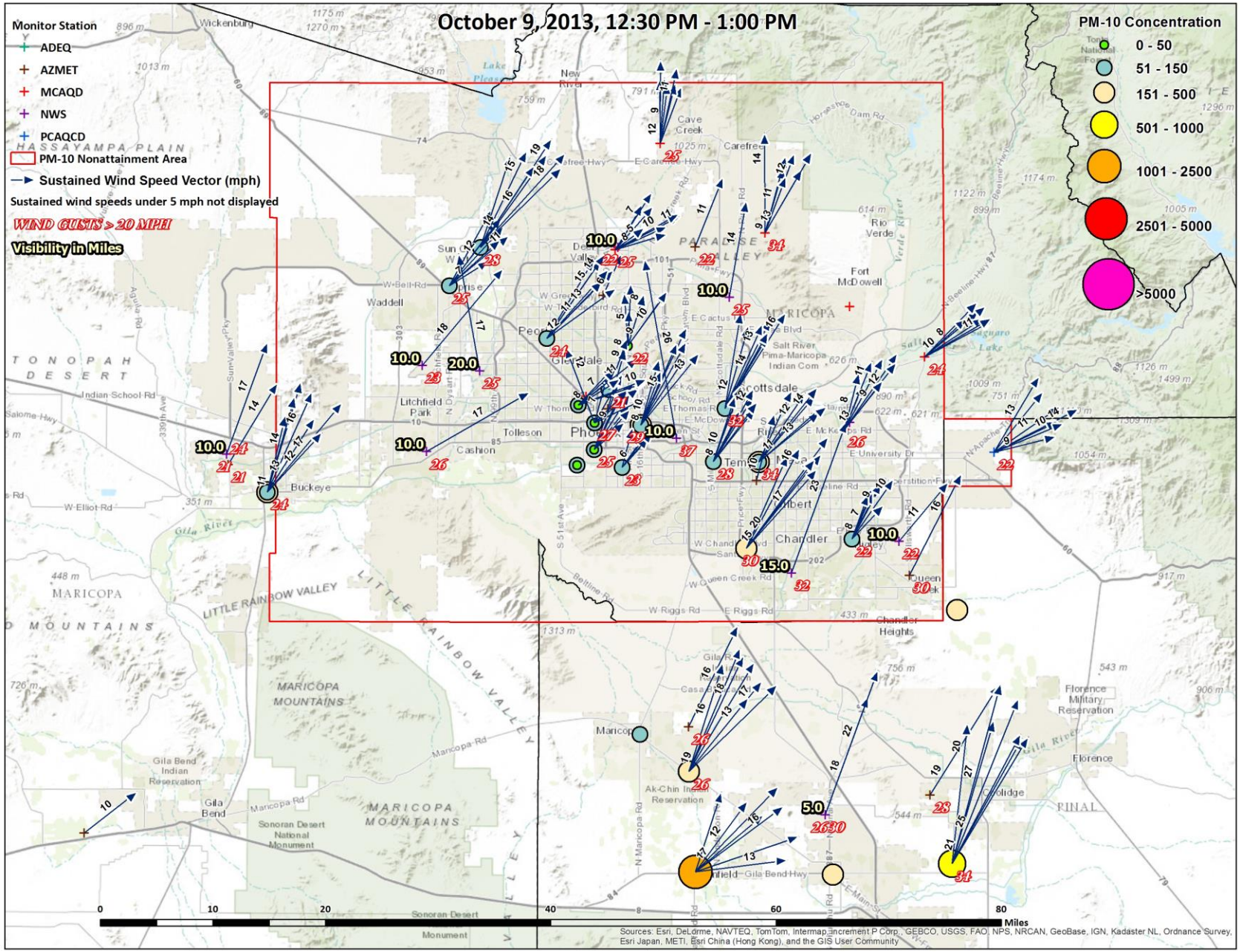


Figure 5-3. October 9, 2013, 12:30 PM – 1:00 PM.

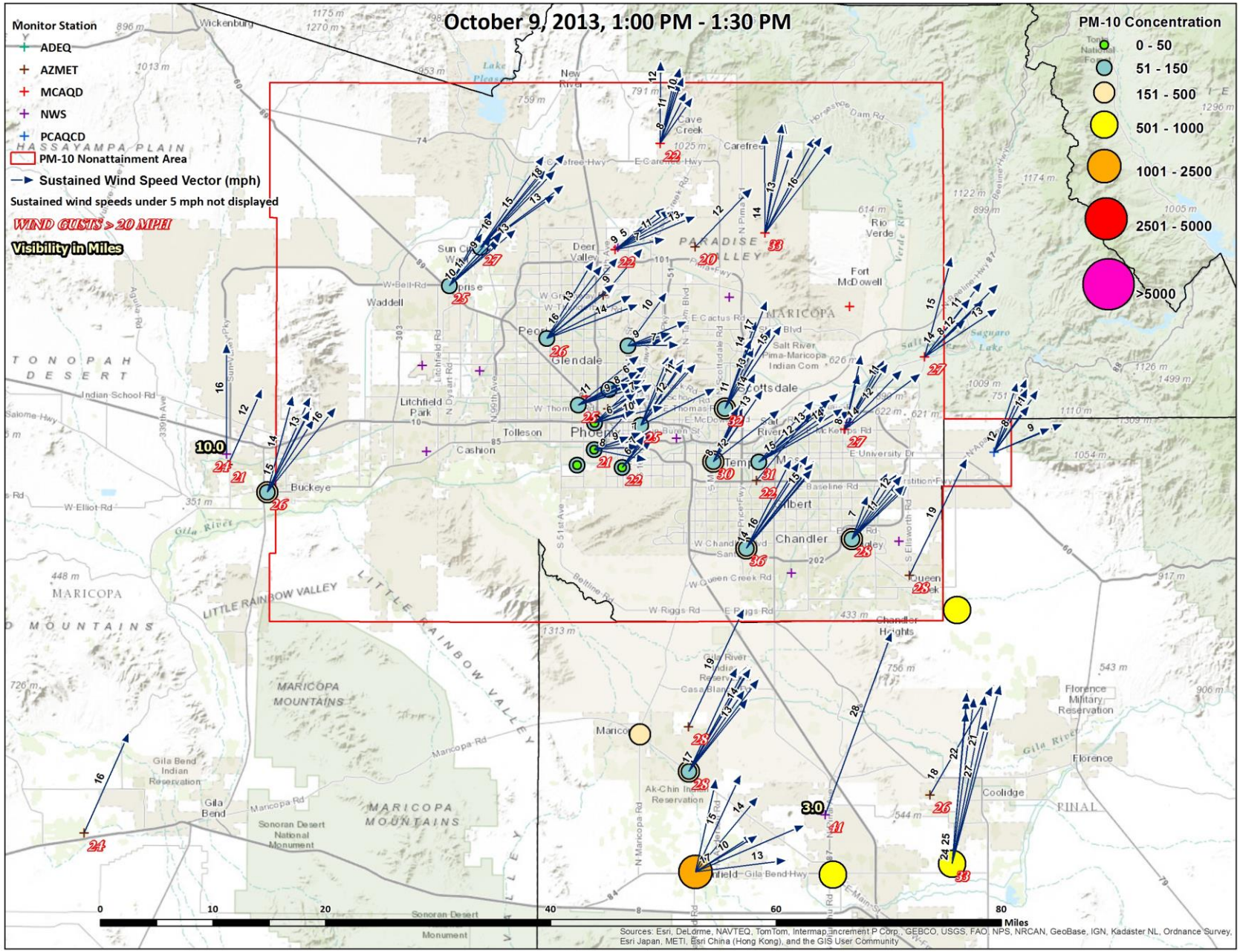


Figure 5-4. October 9, 2013, 1:00 PM – 1:30 PM.

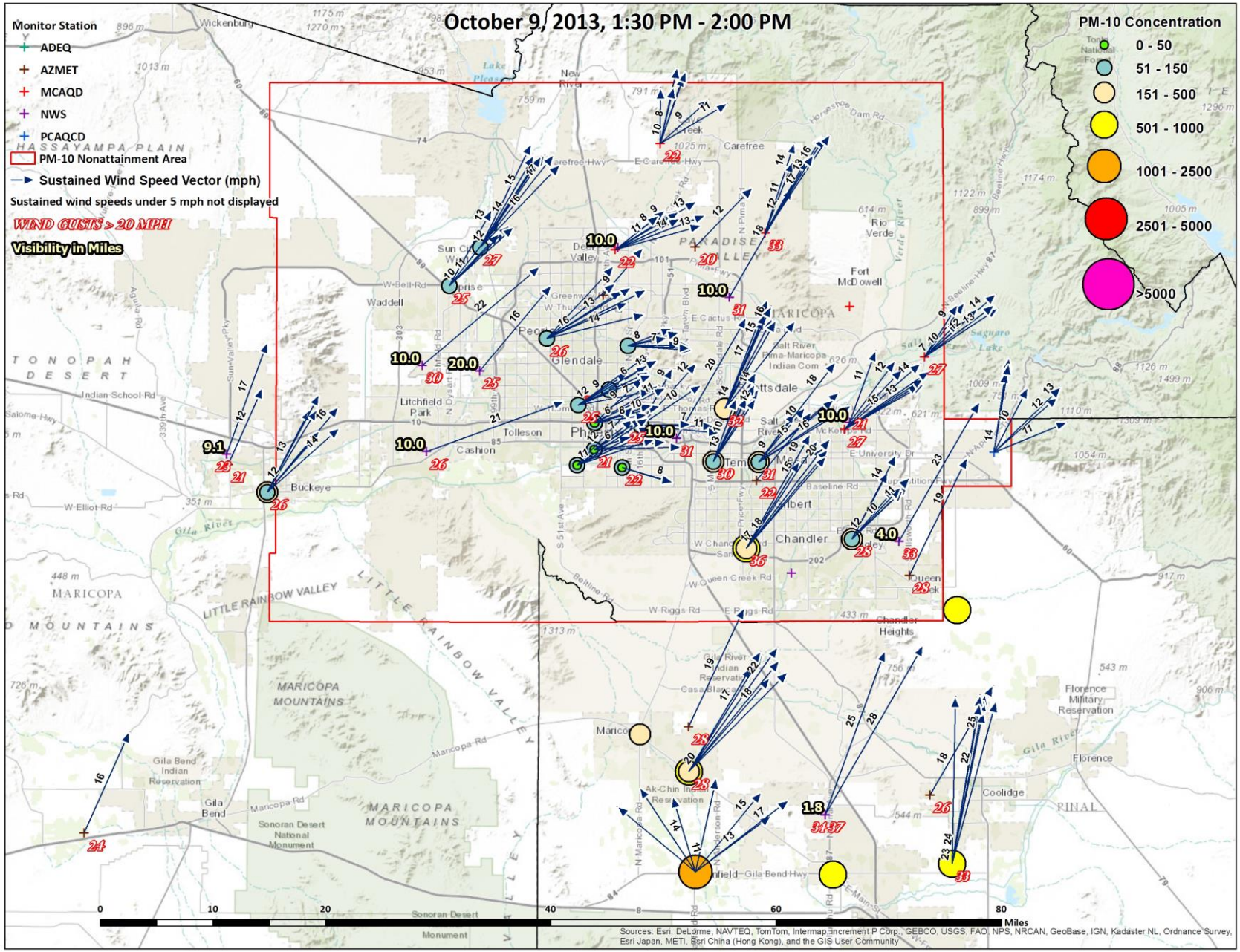


Figure 5-5. October 9, 2013, 1:30 PM – 2:00 PM.

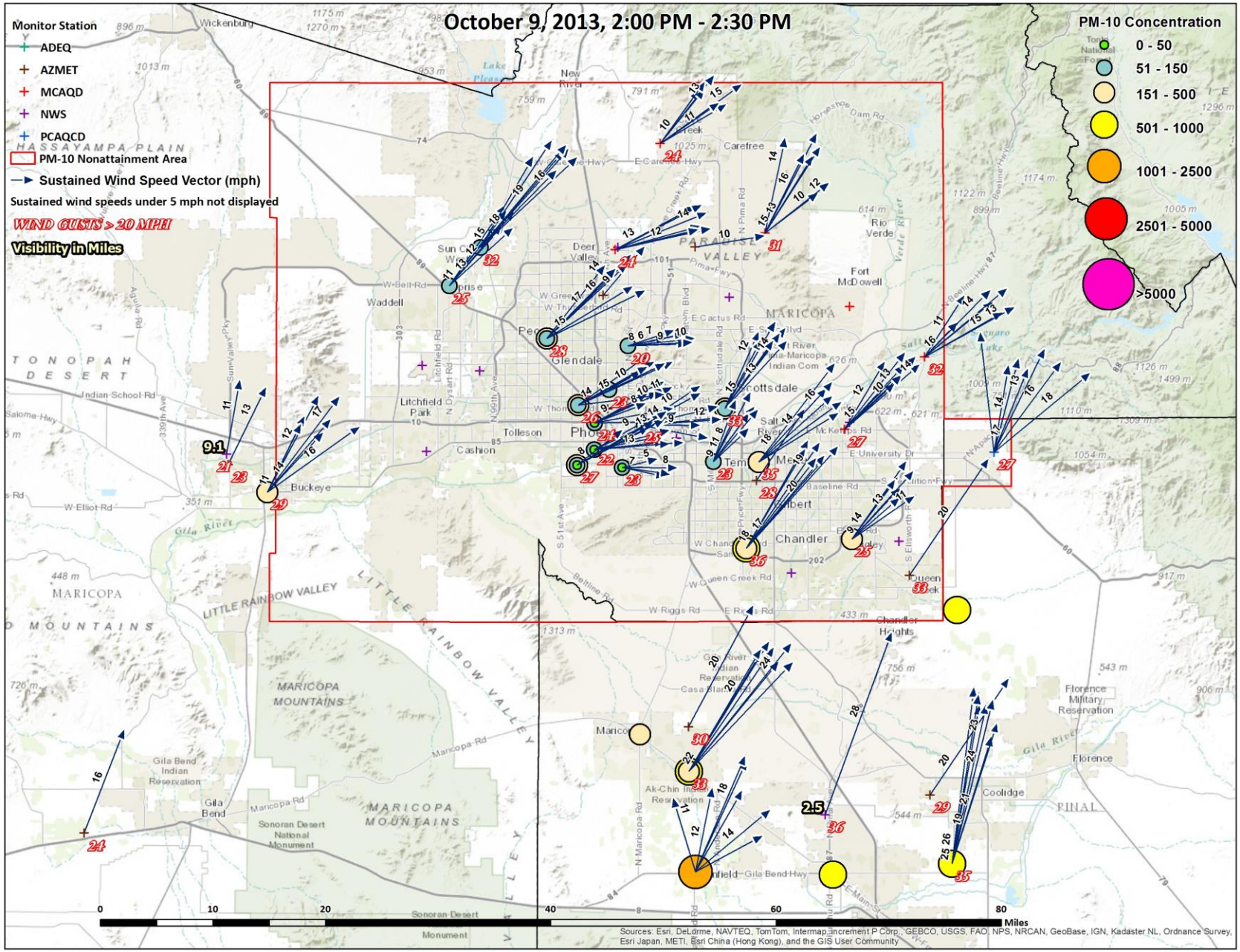


Figure 5-6. October 9, 2013, 2:00 PM – 2:30 PM.

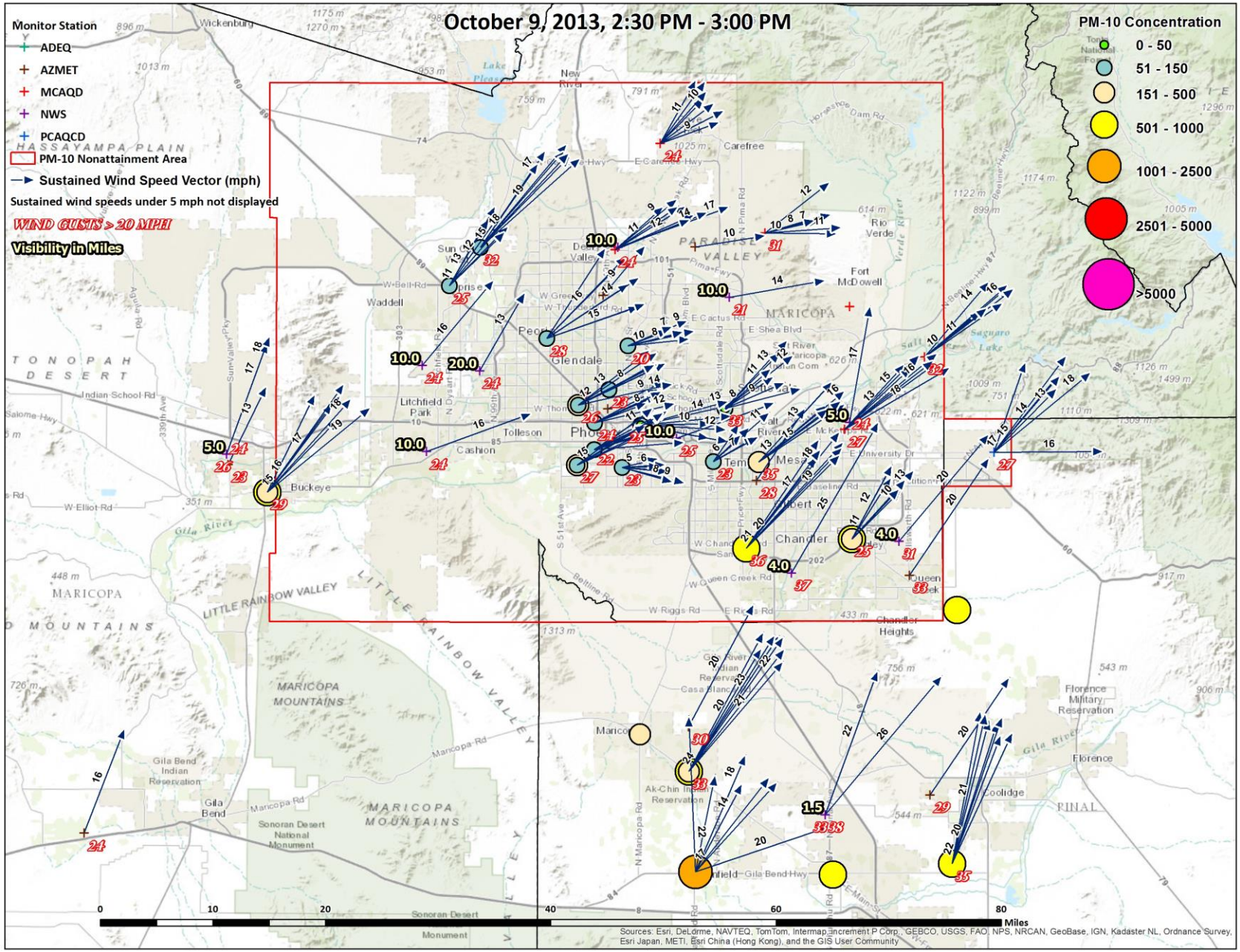


Figure 5-7. October 9, 2013, 2:30 PM – 3:00 PM.

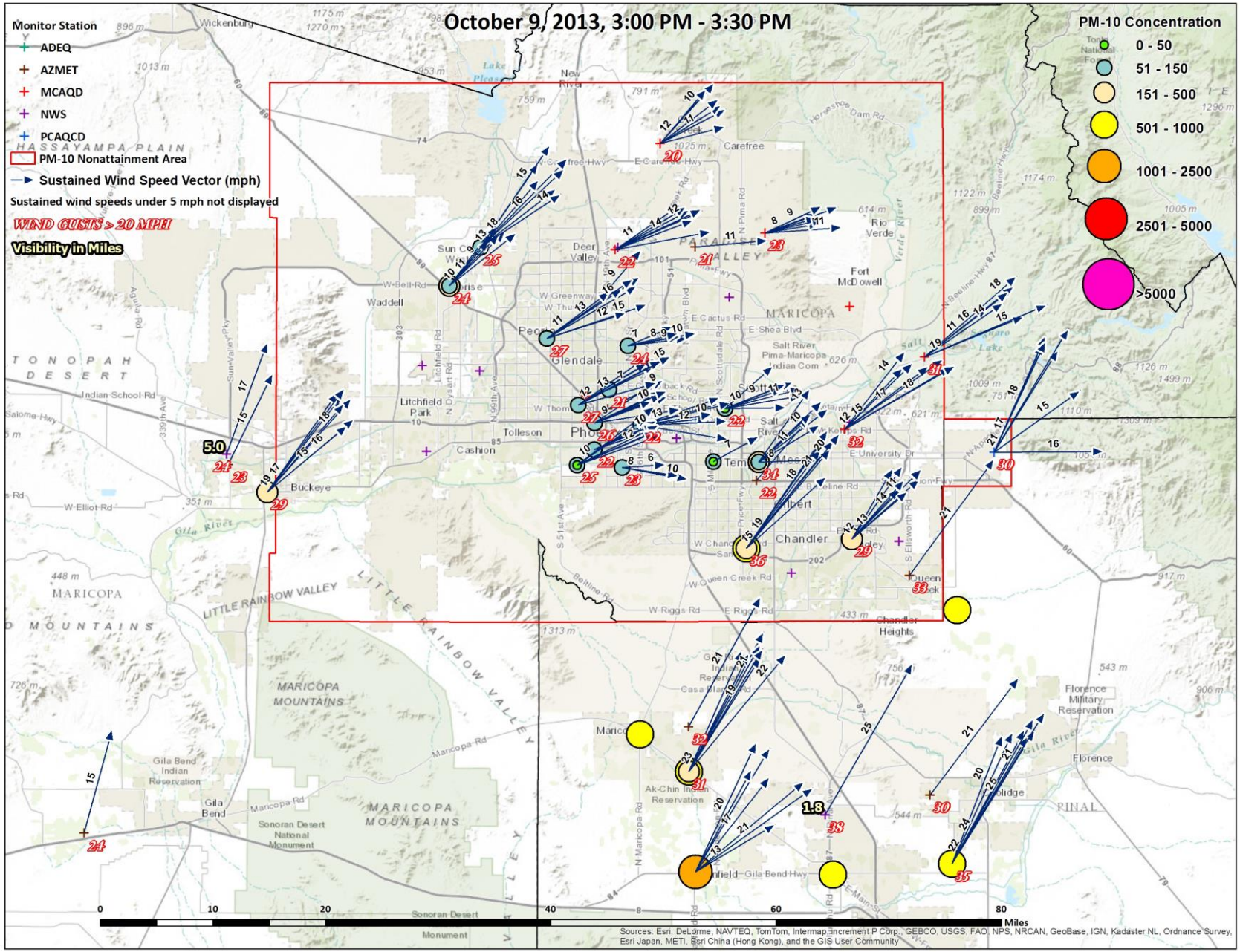


Figure 5-8. October 9, 2013, 3:00 PM – 3:30 PM.

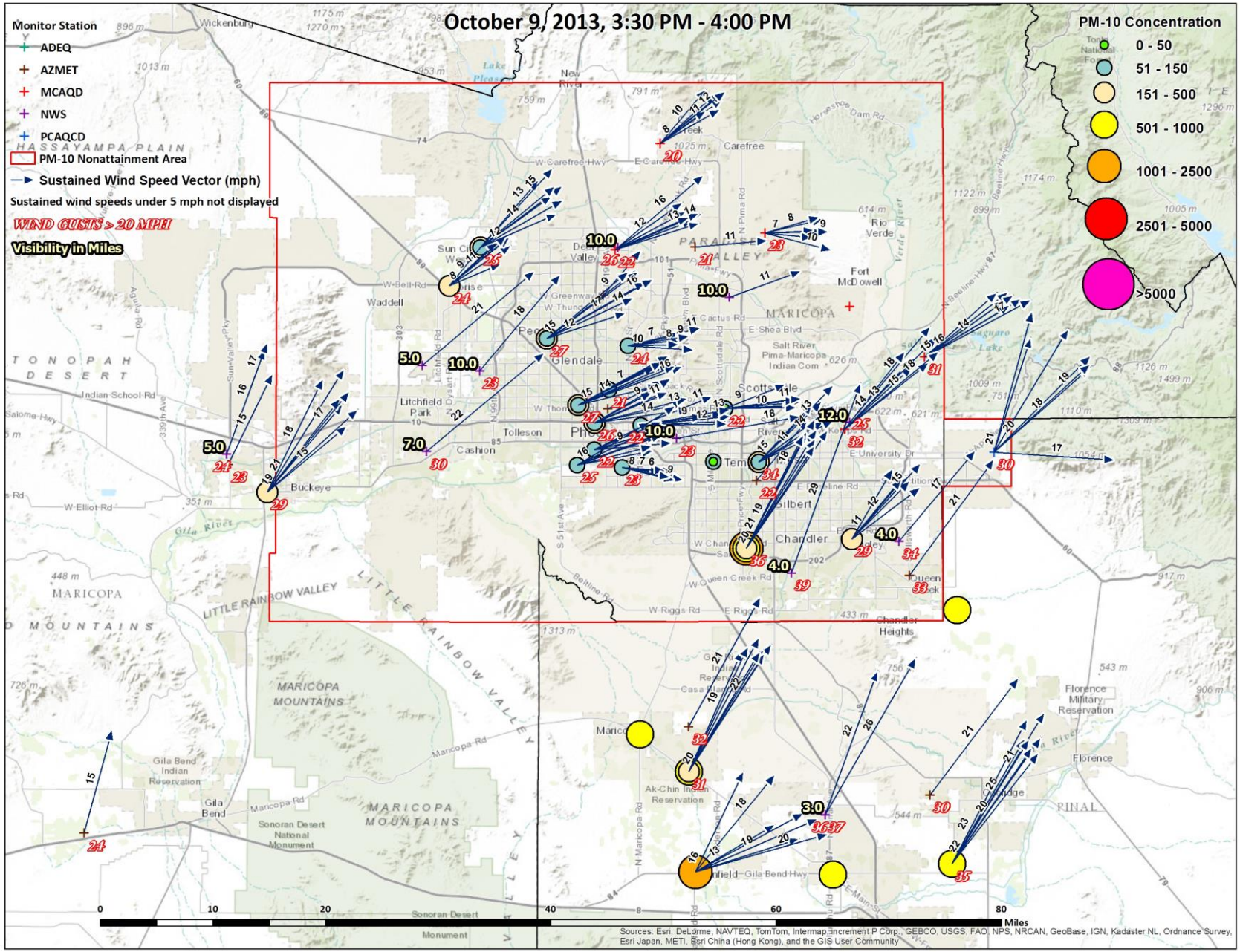


Figure 5-9. October 9, 2013, 3:30 PM – 4:00 PM.

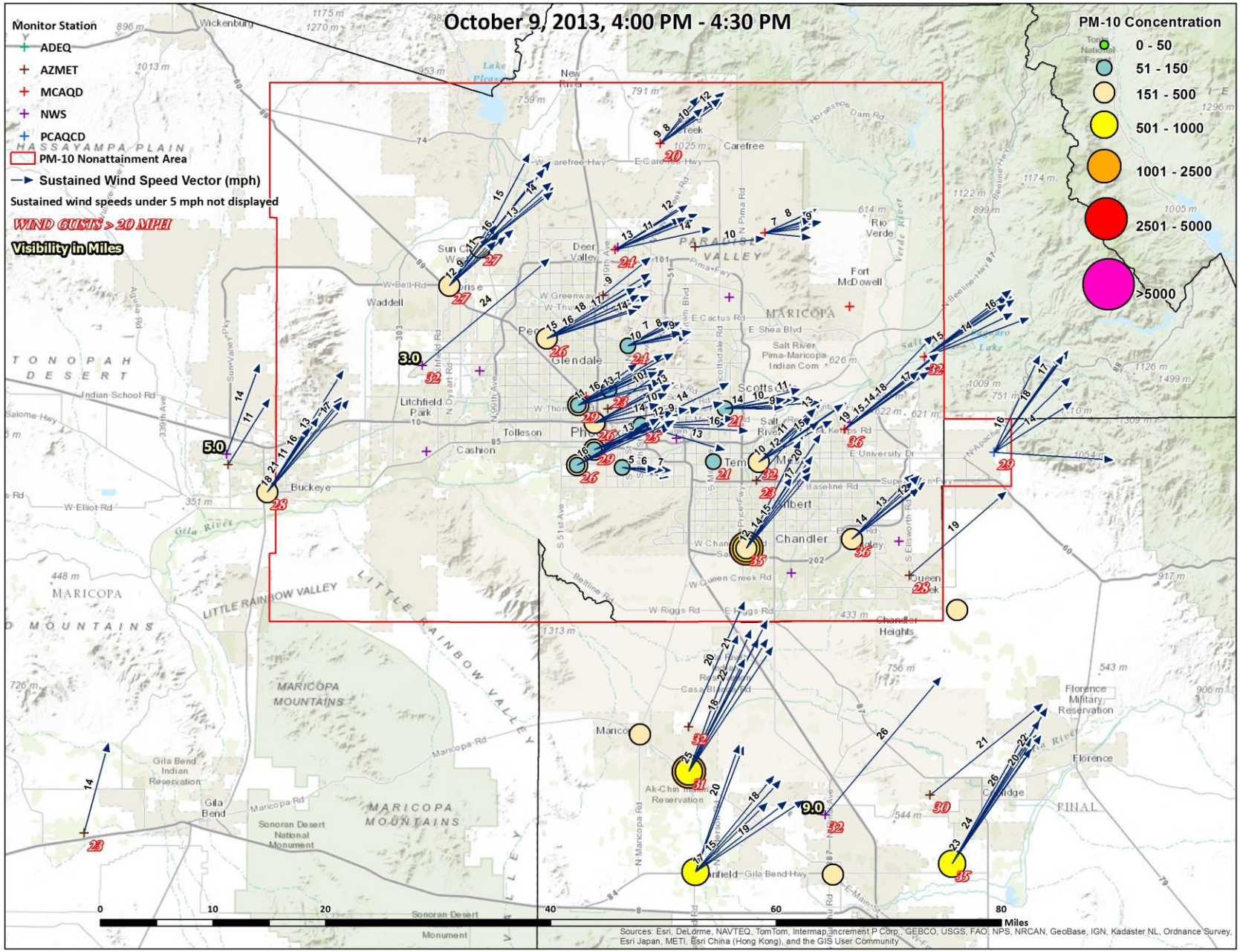


Figure 5-10. October 9, 2013, 4:00 PM – 4:30 PM

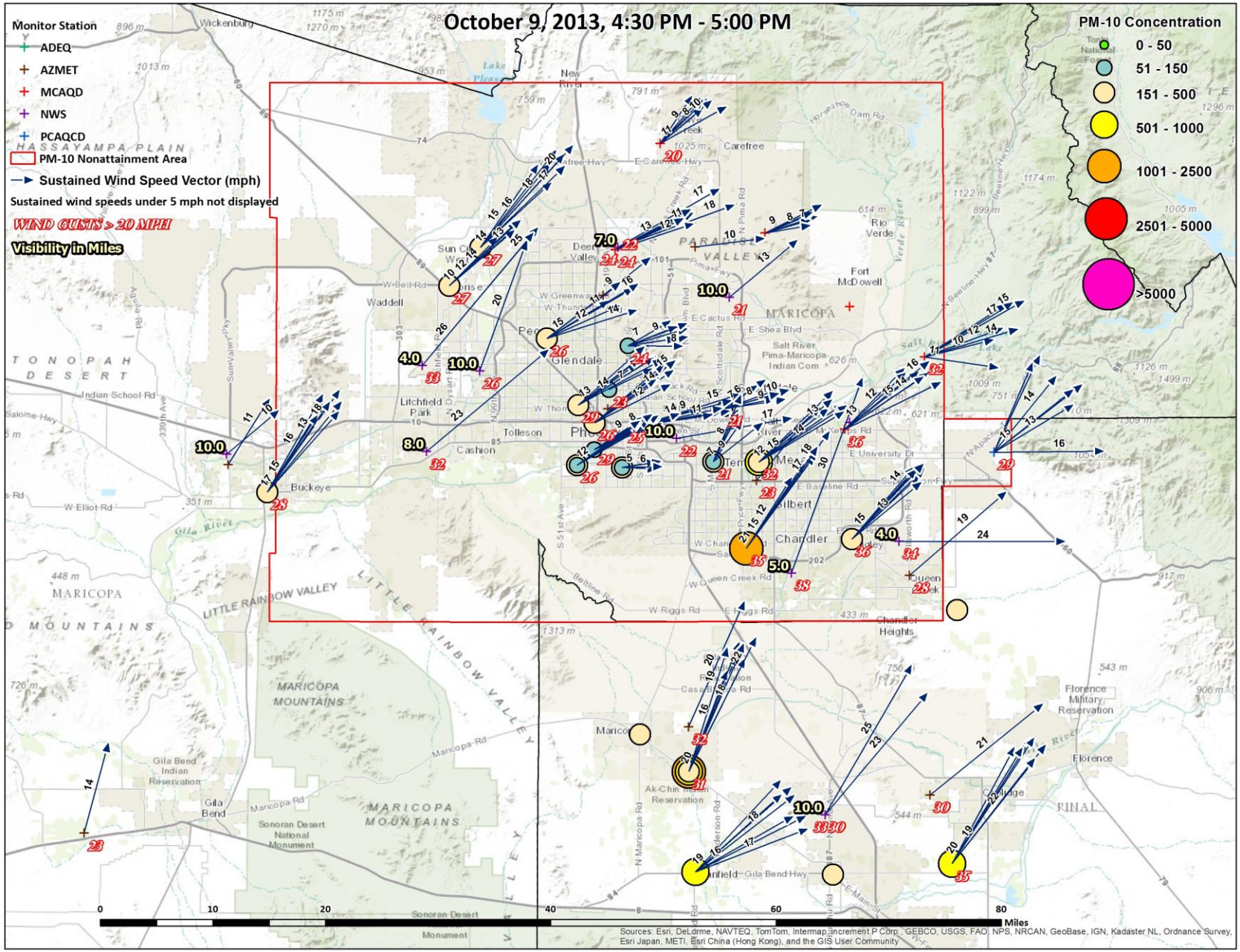


Figure 5-11. October 9, 2013, 4:30 PM – 5:00 PM

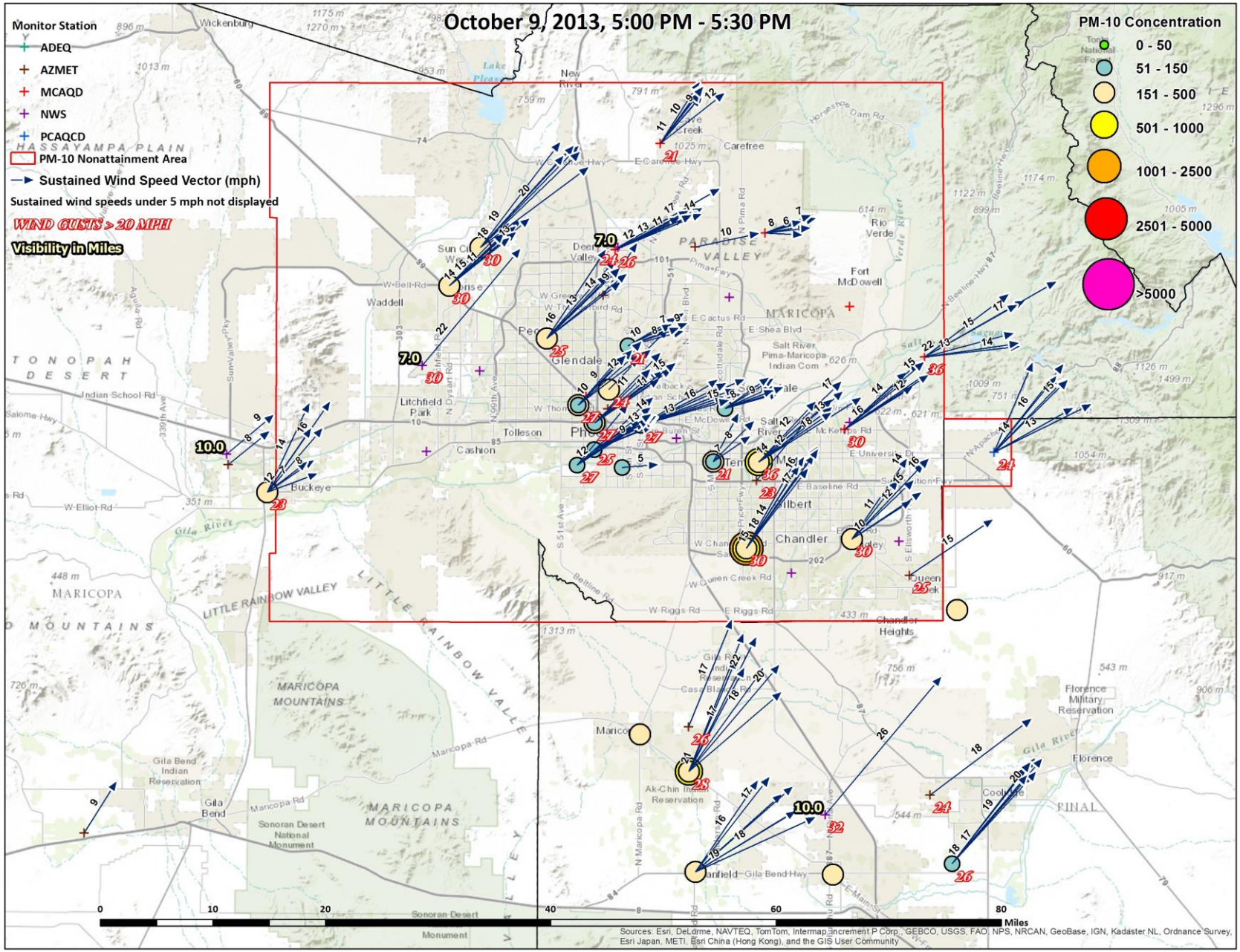


Figure 5-12. October 9, 2013, 5:00 PM – 5:30 PM

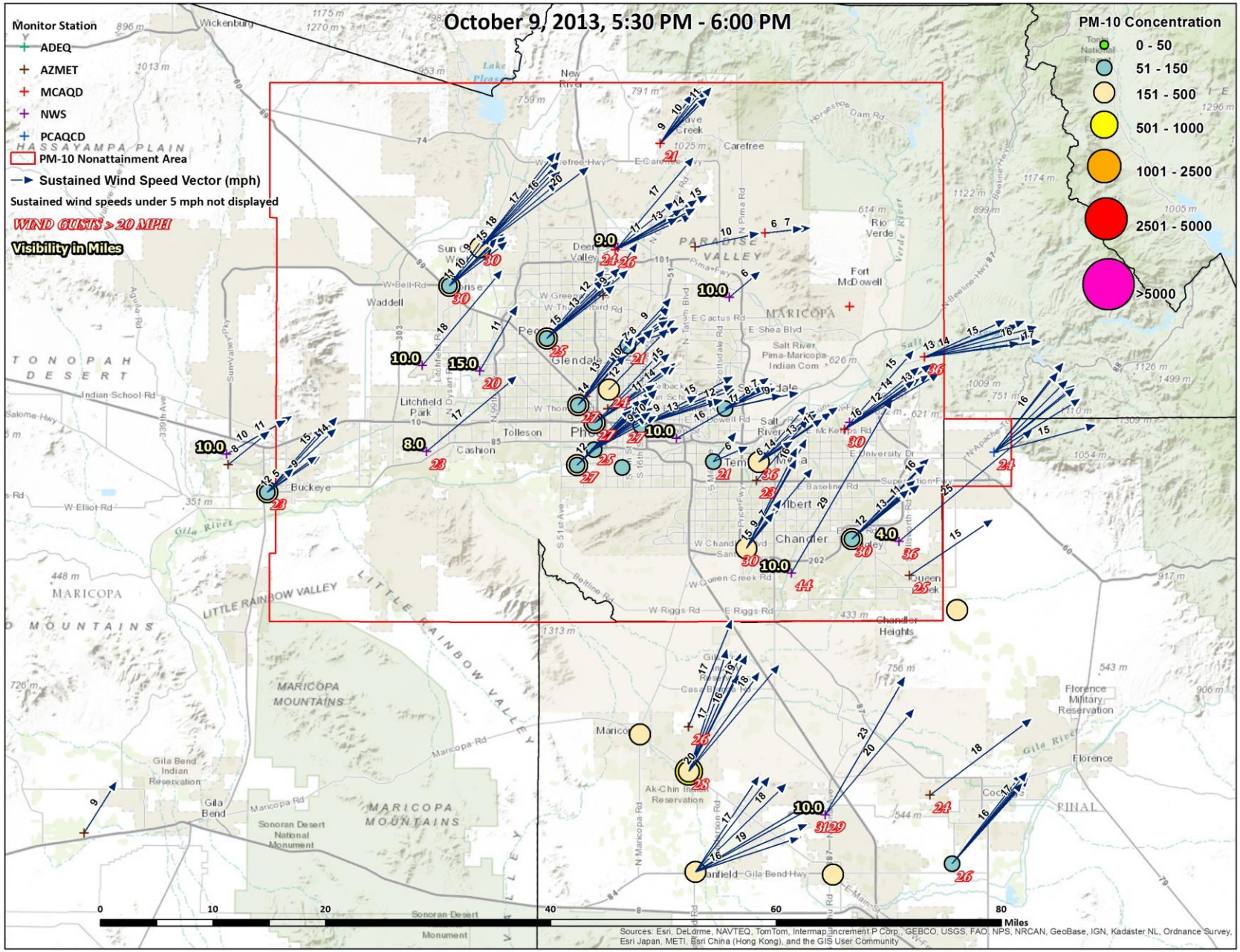


Figure 5-13. October 9, 2013, 5:30 PM – 6:00 PM

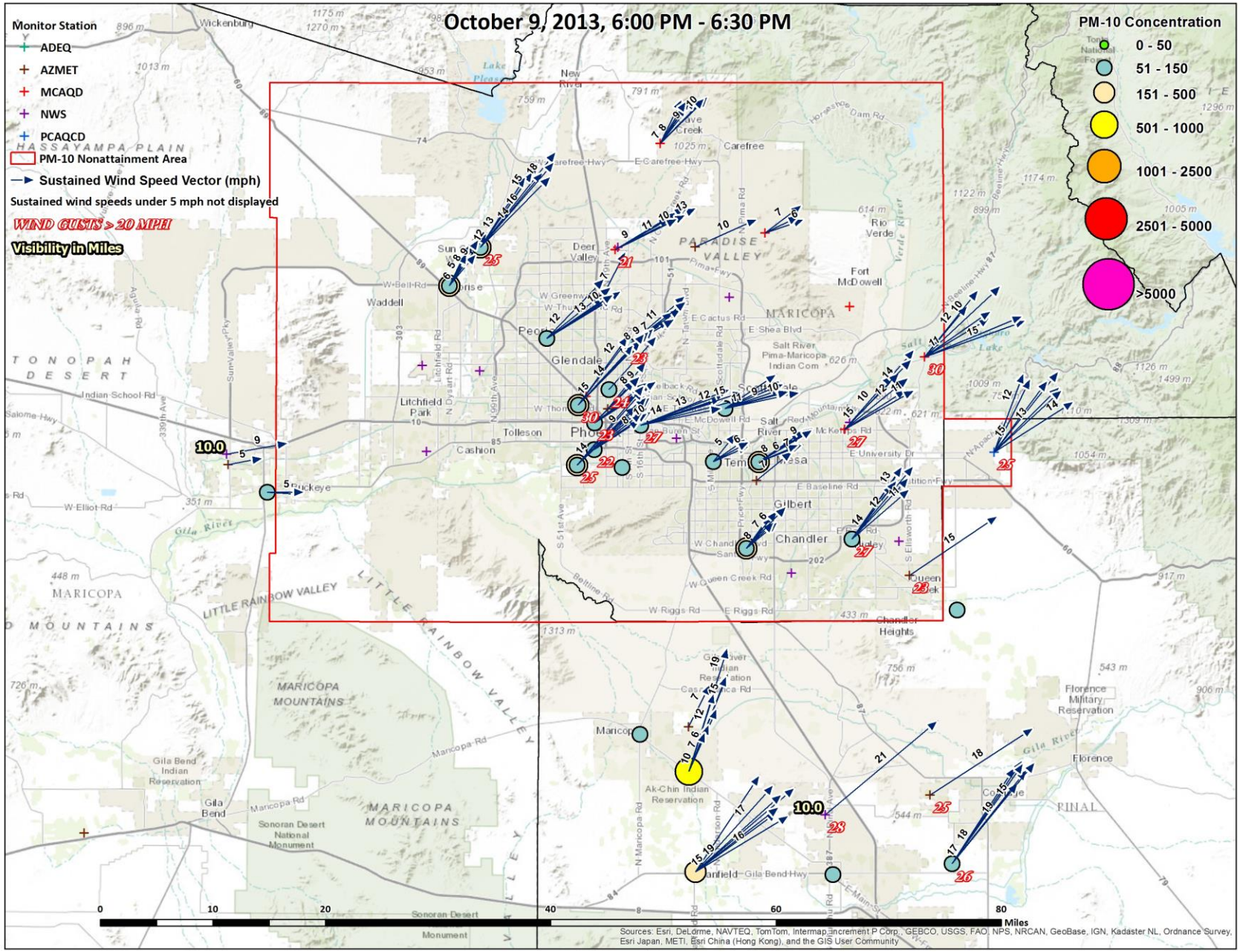


Figure 5-14. October 9, 2013, 6:00 PM – 6:30 PM.

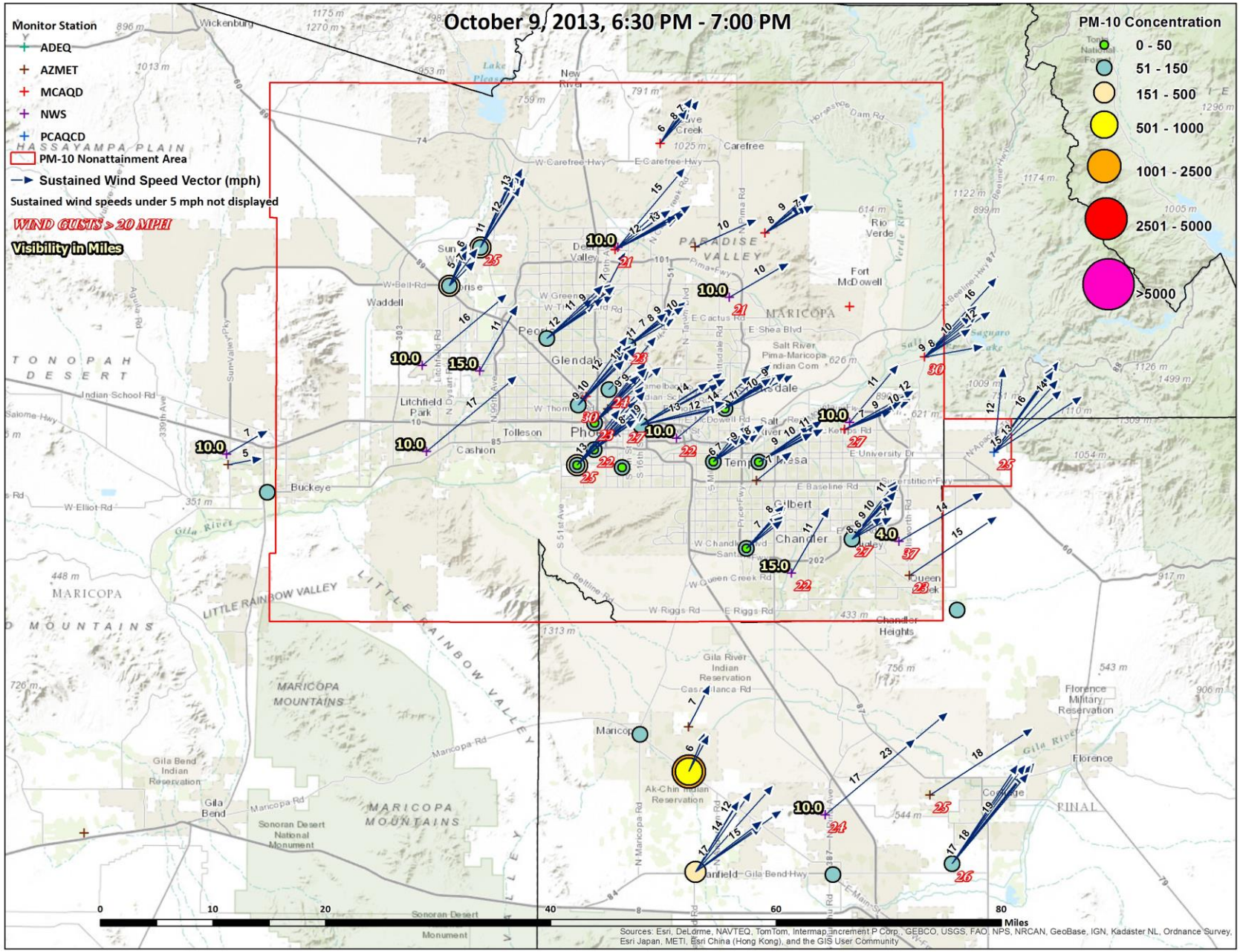


Figure 5-15. October 9, 2013, 6:30 PM – 7:00 PM**.**

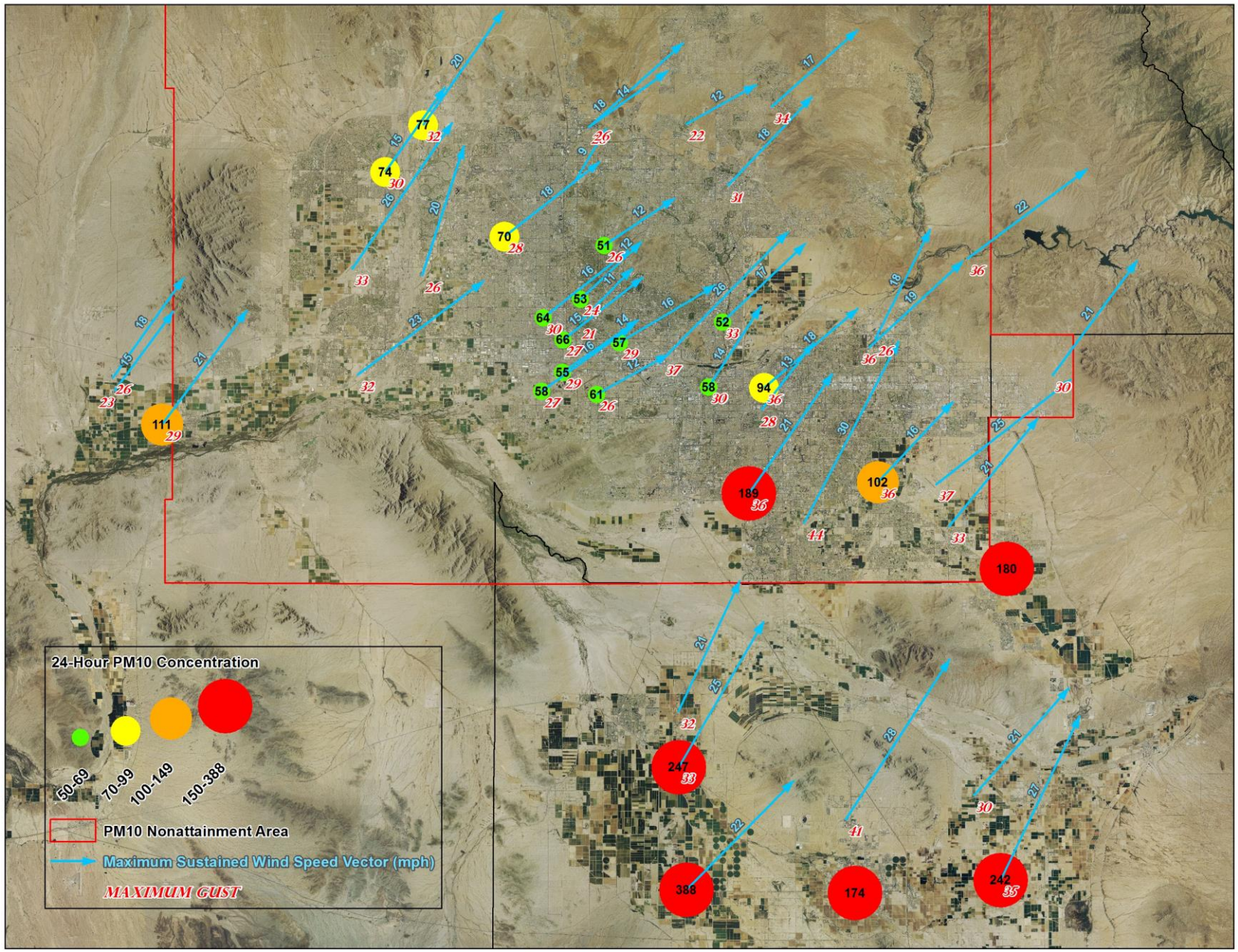


Figure 5-16. October 9, 2013, 24-Hour Summary Graphic

Visibility Photos

Time series videos of visibility photos taken by the Superstition Mountains (link #1) camera in the area of the exceeding monitor clearly show the approach of the windblown dust generated and transported by the low pressure system and the decreased visibility associated with the dust storm. Locations for visibility cameras positioned in the Phoenix area are shown in link #2.

1.) http://www.phoenixvis.net/tlapse_camera.aspx?site=SUPM1

2.) http://www.phoenixvis.net/

Conclusion

The information presented within this section has adequately demonstrated a clear causal relationship between the windblown dust emissions generated and transported by the uncontrollable natural high wind dust event and the exceedance measured at the monitor. The maps and visibility photos provided in this section contain an illustration of the event as it unfolded. The series of maps for the event show a spatial and temporal representation of the low pressure system winds and associated windblown dust as they move throughout Maricopa and Pinal counties. These maps and visibility photos show a clear causal relationship between the windblown dust generated and transported by the low pressure system winds and the exceedance at the West Chandler monitor. The location of the West Chandler immediately downwind of the desert source regions of Pinal County helps to explain why this was the only monitor in the nonattainment area to record an exceedance. It is clear from these data that sustained wind speeds of 30 mph and gusts of 44 mph were strong enough to generate and transport uncontrollable windblown PM10 emissions to the West Chandler monitor and demonstrates the clear causal relationship between the low pressure system winds and the recorded exceedance.

VI. "BUT FOR" ANALYSIS

Section 50.14(c)(3)(iv)(D) in 40 CFR part 50 requires that an exceptional event demonstration must satisfy that "[t]here would have been no exceedance or violation but for the event." The prior sections of this submittal have provided detailed information that the exceedance on October 9, 2013, was not reasonably controllable or preventable and that there is a clear causal relationship between the windblown dust generated and transported by low pressure system winds and the exceedance at the West Chandler monitor. The weight of evidence in these sections demonstrates that but for the existence of windblown dust emissions generated and transported by low pressure system winds, there would have been no exceedance of the 24-Hour PM10 standard.

As detailed in Section IV, all reasonable control measures were in place and actively enforced before, during, and after the exceedance on October 9, 2013. Inspection and compliance data of local fugitive dust sources during this time period revealed that PM10 from anthropogenic activities was well controlled and constant. Local regulatory agencies, industry and the general public were alerted to the arrival of the storm through daily forecasts and a blowing dust and dust storm advisory issued by the National Weather Service. Real-time surveillance of PM10 monitoring stations during the event established a clear link between rapidly rising PM10 concentrations and the arrival of the low pressure system winds. As shown in Figure 6–1, PM10 concentrations in the hours before the event at the exceeding West Chandler monitor were at normal levels, indicating no significant anthropogenic activities. PM10 concentrations in the hours after the event show a quick return to low levels once winds from the low pressure system exited.

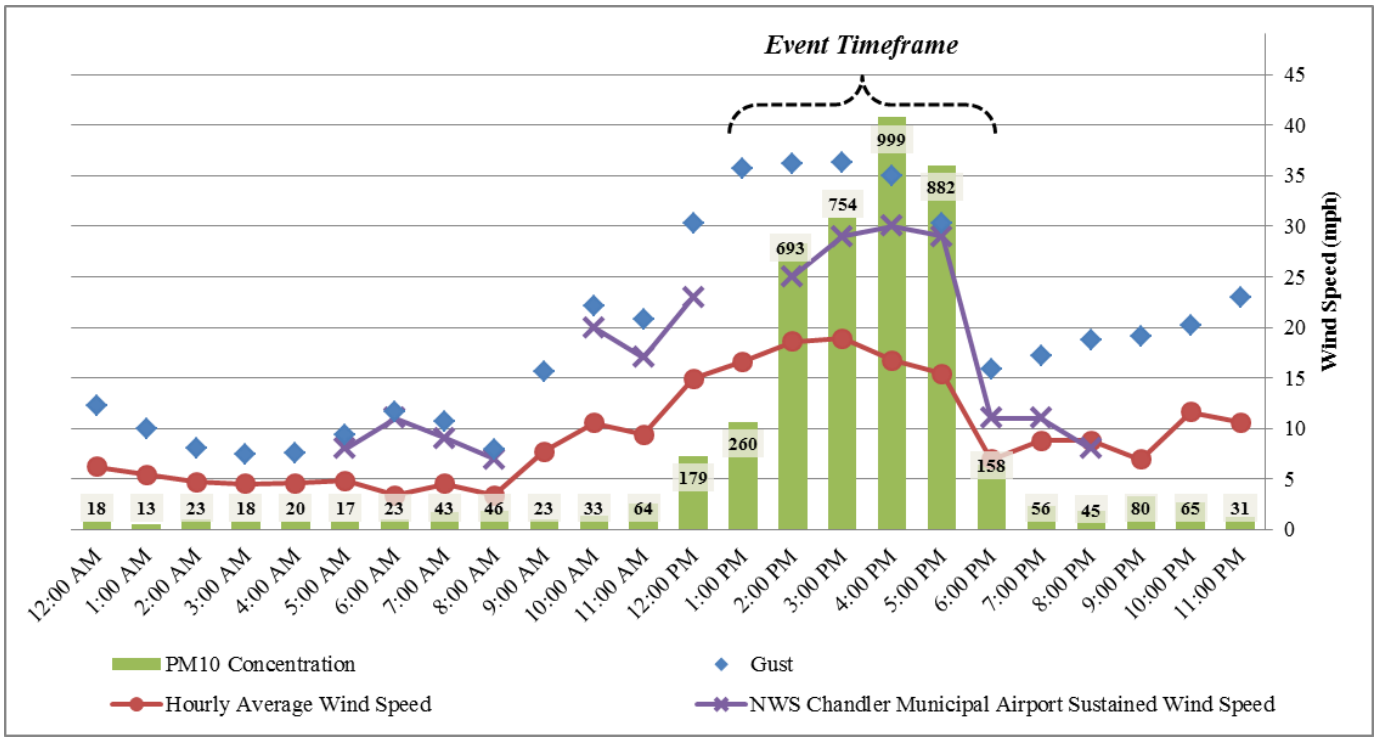


Figure 6-1. Hourly PM10 concentration, wind gust, and average wind speed as recorded at the exceeding West Chandler monitor.

As shown in Section V, detailed, time series maps establish a clear causal relationship between the arrival of windblown dust generated and transported by low pressure system winds and elevated PM10 concentrations at the monitors. Sustained winds up to 30 mph and gusts up to 44 mph overwhelmed all reasonable controls in the nonattainment area and generated and transported widespread blowing dust. The particular location of the exceeding West Chandler monitor immediately downwind of the desert source regions of Pinal County establish the clear causal connection between the exceedance and the windblown dust generated and transported by low pressure system winds.

The body of evidence presented in this submittal confirms that the exceedance on October 9, 2013, was a natural event and that there would have been no exceedance but for the presence of the uncontrollable windblown dust from the low pressure system winds.

VII. CONCLUSIONS

The exceedance that occurred on October 9, 2013, satisfies the criteria of 40 CFR 50.1(j) and meets the definition of an exceptional event. These criteria are:

- The event affects air quality.
- The event is not reasonably controllable or preventable.
- The event is unlikely to reoccur at a particular location or [is] a natural event.

A. Affects Air Quality

As stated in the preamble to the Exceptional Events Rule, the event in question is considered to have affected air quality if it can be shown that there is a clear causal relationship between the monitored exceedance and the event, and that the event is associated with a measured concentration in excess of normal historical fluctuations. Given the information presented in Sections II, III, IV and V, it is reasonable to conclude that the event in question affected air quality.

B. Not Reasonably Controllable or Preventable

Section 50.1(j) of Title 40 CFR Part 50 requires that an event must be "not reasonably controllable or preventable" in order to be defined as an exceptional event. This requirement is met by demonstrating that despite reasonable control measures in place within Maricopa County and the nonattainment area, high wind conditions overwhelmed all reasonably available controls. Despite the deployment of comprehensive control measures and sophisticated response programs, high wind conditions associated with low pressure system winds generated and transported high concentrations of PM10 and overwhelmed controls within the nonattainment area. Sustained winds of 30 mph and gusts of 44 mph easily overwhelmed all available efforts to limit PM10 concentrations from the event. The fact that this was a natural event involving low pressure system winds that generated and transported PM10 emissions in Maricopa County provides strong evidence that the exceedance on October 9, 2013, recorded at the West Chandler monitor was not reasonably controllable or preventable.

C. Natural Event

As discussed above, the event shown to cause the exceedance was emissions of PM10 caused by low pressure system winds on October 9, 2013. The event therefore qualifies as a natural event.

In summary, the exceedance of the federal 24-hour PM10 standard on October 9, 2013, would not have occurred but for the uncontrollable windblown dust emissions generated and transported by low pressure system winds, based on the following weight of evidence:

- Section II explains the meteorology associated with a low pressure system and displays how this type of system produces strong and gusty winds which in turn generate significant quantities of windblown dust.

- The Historical Fluctuation analysis in Section III, showing five years of 24-hour average data for the West Chandler monitor, demonstrates the atypical values recorded at the monitor on October 9, 2013.

- Section IV discusses rules that are in place in the nonattainment area as well as inspections that were conducted in the area to verify compliance with those rules in order to show that the event was not reasonably controllable or preventable and that no significant anthropogenic dust emissions were present during the event.

- Figures in Section V show that the timing of elevated PM10 concentrations at the West Chandler monitor are tied to the progression of low pressure system winds. These sustained winds of 30 mph and gusts of 44 mph generated and transported uncontrollable windblown dust. The proximity of the West Chandler immediately downwind of the desert source regions of Pinal County explains why the West Chandler monitor in particular exceeded the PM10 standard.

- Visibility camera imagery displayed in Section V indicates the widespread nature of the windblown dust caused by the low pressure system winds and provides evidence that high PM10 concentrations are linked to natural sources as opposed to specific anthropogenic sources of dust.